MONTANA DEPARTMENT OF STATE LANDS

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED PLAN OF MINING AND RECLAMATION

JEANNIE S. MINING COMPANY

JEFFERSON COUNTY, MONTANA

Prepared by

Montana Department of State Lands

Commissioner
Montana Department of State Lands

Environmental Administrator
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TABLE OF CONTENTS

Agency Responsibilities and Interagency Relationships

Responsibilities of Montana State Agencies

Department of State Lands

The Montana Board of Land Commissioners[1] (Board) and Montana Department of State Lands[2] (Department) are responsible for the administration of the METAL MINE RECLAMATION ACT (Title 82, Chapter 4, Part 3, MCA). Pursuant to its duties as administering agency for the METAL MINE RECLAMATION ACT, the Department must review and then grant or deny a hard rock mine permit or permit amendment within a period negotiable with the applicant to be not less than 60 days, nor more than 425 days after the submission of a complete permit application. The Department reviews applications for conformance with provisions of the METAL MINE RECLAMATION ACT regarding the method of operation, water control, air quality, mine waste disposal, topsoiling and for the reclamation of lands affected by the proposed mining operations. The Board may adopt rules to accomplish the purpose of the METAL MINE RECLAMATION ACT, and the Department may adopt rules with respect to the filing of reports and the issuance of permits. To insure compliance with the METAL MINE RECLAMATION ACT and rules adopted pursuant to the law, the Department is required to make mine inspections and investigations as necessary.

The Department may not approve hard rock mining in areas which meet the criteria for selective denial provisions as specified in Section 82-4351 of the METAL MINE RECLAMATION ACT. The Department may conduct studies or encourage others to conduct studies of hard rock mining and hard rock mining land reclamation.

When the operator is not in compliance with requirements of the METAL MINE RECLAMATION ACT, rules pursuant to the law, or orders of the Department and has not achieved compliance within time limits set by the Department, the commissioner shall serve a notice of noncompliance on the operator or if necessary, he shall order the suspension of the permit. After a hearing, the Board shall order the Department to revoke the permit if requirements specified in the notice of noncompliance, in the order of suspension, or if an order of the Board requiring remedial measures have not been satisfied.

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[1] The Board of Land Commissioners consists of the Governor, Attorney General, Superintendent of Public Instruction, State Auditor and Secretary of State.

[2] The Commissioner of State Lands is the chief administrative officer for the Department of State Lands and is appointed by and serves at the pleasure of the Governor.

Montana Department of Health and Environmental Services

The Air Quality Bureau of the Department of Health and Environmental Sciences has primary responsibility for air pollution control activities in the State of Montana. These responsibilities include the review of new sources of air pollution to be located in the state, enforcing standards and ensuring that federal standards are achieved and maintained.

The Montana Clean Air Act (Title 75, Chapter 2, MCA) provides rule making authority to the Board of Health in regard to permits (Section 75-2-211). This rule making authority was exercised by the adoption of rule MAC 16-2.14(1)-S1415. This rule provides that, prior to the construction or operation of any new or modified equipment of certain categories, a permit be obtained from the Department of Health, Air Quality Bureau.

An application for the Air Quality Permit was filed by JSMC with the Department on December 7, 1979. The permit was granted on February 12, 1980 with approval contingent upon several conditions. A copy of the Department's Preliminary Environmental Review and permit conditions is contained in Appendix A.

Department of Natural Resources

The Montana Department of Natural Resources and Conservation is charged with administration of the Montana Water Use Act (Title 85, Chapter 2, MCA). The act is the statutory foundation of Montana's water law and became effective July 1, 1973.

For wells or developed springs with a beneficial use of less than 100 gallons per minute, a "Notice of Completion of Groundwater Development of Less Than 100 Gallons Per Minute" form must be submitted to the Department together with a filing fee within 60 days of the spring or well development (85-2-306, MCA). The proposed settling pond and makeup water well will necessitate the filing of the above form by the Jeannie S. Mine Company. Although the initial water use from the pond is proposed to be 1,000 gallons per minute, the long-term use of the pond for makeup water is anticipated to require use of less than 100 gallons per minute by the closed circuit water system. Following a review of the form, the Department sends a certificate of water right to the local county clerk and recorder who records the information and forwards the certificate to the well owner. In the case of the Jeannie S. Mine Company make-up water well, a "Well Log Report" must also be completed and submitted to the Department by the licensed well driller.

A final determination of the water appropriation permits or approvals required by the Jeannie S. Mine Company proposal has not been made at this time and additional permits or approvals may be required in the future.

Relationships Among State Agencies

Two State Agencies, the Department of State Lands, and the Department of Health and Environmental Sciences, have decisions to make in regard to the Jeannie S. Mine Company mining proposal that require environmental review under the Montana Environmental Policy Act.

I. DESCRIPTION OF JEANNIE S. MINE COMPANY MINING PROPOSAL

A. Mining Proposal

1. Background

The Jeannie S. Mine Company (JSMC) is a joint venture of (1) the Jeannie S. Corporation, a Pennsylvania corporation, (2) the Boulder Mining Company, a Montana corporation, and (3) Northwest Mining Corporation, a Montana corporation. Jeannie S. Corp. has obtained the mineral lease for the proposed mine permit area from the present landowner. Northwest Mining Corp. is newly formed to engage in heavy construction, mining, and earth moving. Boulder Mining Company is newly formed to provide technical assistance and engineering advice. The principal agent for the joint venture is Arthur J. Seiler II, General Manager, Norristown, Pennsylvania.

The proposed permit area is approximately two miles south of Boulder, Montana, in Jefferson County, and is located in portions of Sections 5, 8, and 9 in Township 5 North, Range 4 West (Figure 1). The proposed permit area consists of parts of several patented placer mining claims owned by Roberta, Paitow, and Julian Wegener, Basin, Montana. The metes and bounds description of the proposed permit area is detailed on Figure 2. Mineral and mining rights have been leased from the Wegener family by the Jeannie S. Corp. for the purpose of extracting placer gold deposits. Recent exploratory drilling indicates that economical deposits of placer gold exist in the proposed mining area.

2. Mine Development

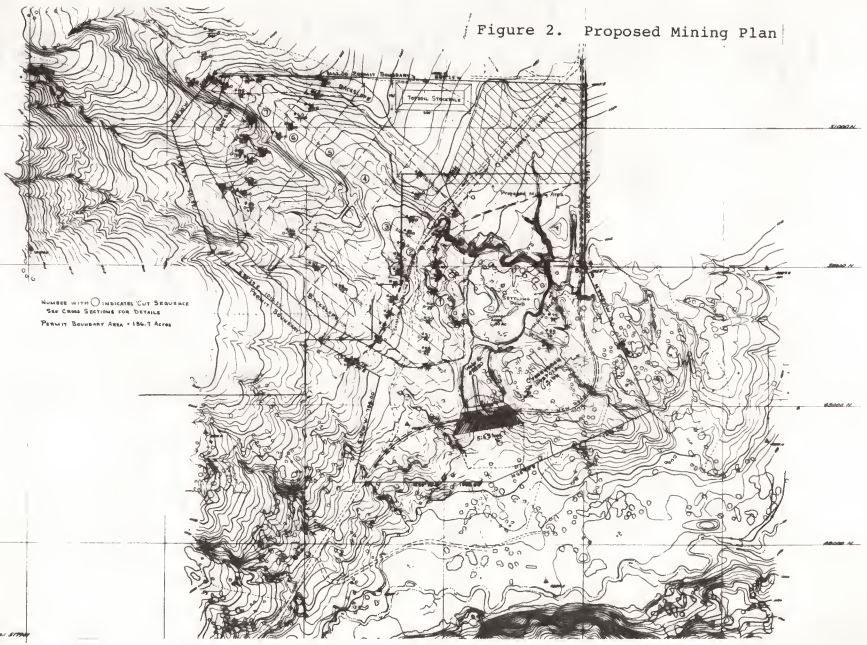
The total area to be mined over the estimated six to seven year life of the operation would be approximately 75 acres. The total area to be disturbed, including reclaimed areas in the previously mined Chinese Diggings, mined areas, final contoured areas, topsoil stockpile area, reservoir, and associated mining facilities would be approximately 150 acres.

Mining would involve the recovery of placer gold lying beneath 30 to 100 feet of overburden. Economic concerns require a high volume, low cost per ton mining method. Because of the amount of overburden involved, conventional strip mining techniques would be employed. Procedurally, this would involve stripping and stockpiling of overburden and useable topsoil for later reclamation.

Development for mining is expected to commence as soon as a permit is granted. Figure 2 shows the specific area proposed to be mined. Mining would begin shortly after development, and proceed in a series of cuts and fills starting at the Chinese Diggings and moving northwestward. Once mining has progressed to the northwestern limit of the permit area, the operation would be moved to the area immediately north of the Chinese Diggings.

Figure 1. Proposed JSMC Mine Site, Jefferson County, Montana

Figure 2. Proposed Mining Plan



Road construction, topsoil stripping and replacement, overburden removal, and gravel hauling would be accomplished using primarily scrapers, loaders, or any combination of these. Final contour would be shaped where necessary by bulldozers or patrol. No haul roads would be built, since the wash plant would be located adjacent to the placer gravels.

a. Placer Processing

Placer gravel would be washed by a standard dryland placer washing plant, which would be moved periodically to follow the mining operation. The wash plant would consist of a boil box, where gravel and water are first introduced and 60 to 90 feet of sluice. Capacity would range from 50 to 100 cubic yards of gravel per hour. Washed gravel would be deposited below the plant in the mine cut and leveled with a dozer, Fines would be carried by a sand line and distributed evenly over the top of the washed gravel. Startup and makeup water would be obtained from a water retention reservoir constructed in the Chinese Diggings area of the mine site. Water returning from the washing plant would first percolate through the washed gravel tailing to filter out sand or other sediment, and then would either be channeled to settling and collecting ponds in the pit for recycling, or allowed to drain along the bedrock and eventually reach the retention reservoir in the Chinese Diggings. Any water encountered during mining, either groundwater or surface runoff, would be captured for use in the washing operation. Water requirements for the washing operation are approximately 1,000 gallons per minute (gpm). Most of this water would be recycled continuously. However, some makeup water would be required because of evaporation losses, groundwater movement towards the Chinese Diggings, and water retention by sand and gravel particles. Some makeup water would be available from groundwater recharge. Additional makeup water would be pumped, if needed, from (1) an alluvial well proposed to be located adjacent to the Little Boulder River, (2) a runoff settling pond, and (3) the developed reservoir in the Chinese Diggings. Makeup water requirements are anticipated to be less than 100 gpm or about 25 acre-feet per month for the six-month operating period.

b. Surface Drainage Control

Where operations result in a need to prevent sedimentation, on or in adjoining lands or streams, JSMC will provide for the construction of earth dams or other reasonable devices to control water drainage, provided the formation of such impoundments or devices shall not interfere with other landowners' rights or contribute to water pollution (as defined in the Montana Water Pollution Control Act as amended).

There are no natural streams or springs in the permit area. One impounding structure would be built as shown in Figure 2. This structure would be designed to contain the entire runoff of the 10 year - 24 hour precipitation event in the 560 acre drainage basin above and including the proposed permit area. The impoundment would be constructed with an

adequate spillway to protect it from the 100 year - 24 hour event. A typical cross-section of the impoundment structure is shown in Figure 3.

Upon abandonment, water from the development or mining activities shall be diverted or treated in a manner designed to control siltation, erosion, or other damage to streams or natural water courses.

c. Overburden and Topsoil

First year mining is planned to begin at the northwestern edge of the Chinese Diggings, a former placer mining location operated in the late 1880's. This would involve the stripping of about 30 feet of overburden, or about 915,064 cubic yards. Tentative plans include mining a 1- to 2-acre pillar in the Chinese Diggings, shown in Figure 2. If the pillar is mined a retaining structure will be built or maintained to ensure that the proposed retention pond will remain intact during the 100 year - 24 hour precipitation event. The total area to be mined in the first 12 months is approximately 21 acres, beginning at the northwestern edge of the Chinese Diggings and progressing northwestward. Overburden from the first cut will be used to build the impoundment structure, the new access road, and for contouring the area shown in Figure 2. Additional overburden would be stockpiled near the access road, within the Chinese Diggings, or to the north as shown in Figure 2.

The second and succeeding years of mining would require moving increased amounts of overburden, ranging from 40 to 100 feet thick as the mining operation progresses to the northwest. Approximately equal surface acreage would be mined each year (about ten acres). Annual volumes of overburden removal will range from about 512,160 cubic yards during the second year to about 984,798 cubic yards in the sixth year (Table 1). If future exploration shows that economical gold deposits exist within and directly north of the Chinese Diggings, that area may be mined during the seventh year. Overburden ranges in depth in this area from 30 to 40 feet and would be used to recontour the existing highwall areas from previous mining.

Topsoil from all of the cut area would be stockpiled to achieve a mixing action (Figure 2). Two lifts would be taken where feasible. The first lift would contain primarily high organic material. The second lift would contain lime layers, loamy sands and material somewhat higher in rock fragments. The lifts would be stockpiled separately, graded and seeded to promote surface stabilization.

d. Road and Powerline Development

Construction of in-mine haul roads would not be necessary, since placer gravels would be processed on-site. A portion of the existing access road, now used as access to the Wegener residence and recreational areas in National Forest lands along the upper Little Boulder River, and for gravel haulage by Jefferson County, would be relocated to the southeast as shown in Figure 2.

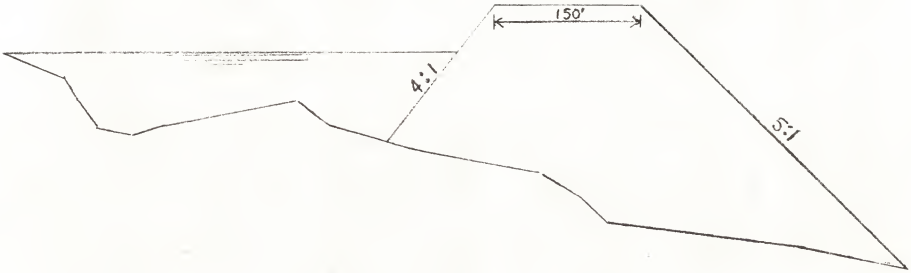


Figure 3. Typical Cross Section
of Impoundment Structure.

TABLE 1. Proposed volumes of topsoil, overburden and gravel removal for the Jeannie S. Mine

Cut #	Topsoil and Overburden (yd^3)	Gravel (yd^3)
1	402,904	124,246
2	512,160	121,633
3	708,532	122,067
4	783,815	124,556
5	936,387	118,105
6	974,798	99,144
7	577,801	53,764
	4,896,397	763,515

All plant operations and water pumping would be powered by electricity supplied by the Montana Power Company from an existing power line that now crosses the permit area. The existing powerline is presently dead, and will require the initiation of power service. Temporary lines would be maintained from the utility line to the washing operation and would be dismantled after the mining operation is completed.

e. Dust Control Measures

All reasonable and proper precautions would be taken to assure that exposed cuts or spoil disposal areas will not be subject to wind erosion to the extent that air-borne detritus becomes a public nuisance or detriment to the flora and fauna of the area.

f. Employment Requirements

The proposed mining and associated gravel washing operation would operate on a 7-day-a-week schedule for about 200 days per year. The operation would cease during each winter season. It is anticipated that overburden removal would be done during daylight hours and the washing plant would operate 24 hours per day. Approximately 5.6 million cubic yards of overburden and gravel would be moved over the life of the operation.

The operating crew would consist of eight to twelve persons, split into two or three shifts. It is anticipated that at least half of the personnel would be hired locally. Wages would be comparable to those paid for local heavy equipment operators and amount to approximately $150,000 annually.

g. Mining Equipment and Facilities

Equipment that is proposed to be used in the mine permit area includes scrapers, a patrol, and loaders which would be provided by a local contractor. The wash plant and one large front-end loader would be purchased by the JSMC. A small office building, a gold handling building, a lubricant storage shed, and a machine maintenance garage would be built adjacent to the mining operation.

B. Reclamation Plan

The Jeannie S. Mine Company will secure a reclamation and revegetation bond in the form and amount to be determined by the Department in accordance with Section 50-1211. The company agrees that in the absence of an order by the Board providing a longer period, the reclamation activities will be completed within two years after any area in the proposed reclamation plan becomes abandoned.

1. Mine and facilities

Figure 2 shows the general locations of the mine area, topsoil stockpile, and overburden disposal areas. Jeannie S. Mine Company would

conserve for use in reclamation all appropriate soil materials that can be recovered from areas to be disturbed, provided that recovery of this material would be practical and could be done without jeopardizing the safety of men and equipment.

Gravels containing placer gold would be worked in place by the washing plant. Washed gravel and sand would be placed back into the same cut. Topsoil and overburden removed from each cut by a scraper would be stockpiled. Topsoil would be stored in two piles, one for each lift. After each cut area is refilled with washed gravels and overburden, topsoil would be replaced, the second lift being spread before the first. The overburden and gravel surface would be left roughened after final shaping to prevent slippage of the respread topsoil. The topsoil would be spread to as uniform thickness as is practical. Revegetation would be initiated in the first appropriate planting season following grading and topsoiling of the disturbed areas.

In order to prevent wind and water erosion, JSMC would maintain the firmness of all stockpiled soil materials. The overburden disposal sites would be graded into the natural topography, with 2:1 slopes or less. Following grading, all disturbed areas would have a layer of topsoil placed on them and be reseeded according to Table 2. The proposed final topography of the mined area following reclamation is shown in Figure 4.

2. Revegetation

To the extent reasonable and within practical limits, JSMC would return the maximum amount of disturbed land back to its use prior to mining being undertaken in the area, i.e., grazing of cattle.

JSMC would establish a vegetation cover in compliance with recommendations by the Department of State Lands. Should the initial revegetation attempt fail, JSMC would seek the advice of the Soil Conservation Service and the Department of State Lands before making a second attempt at establishing acceptable vegetation in the area.

Vegetation cover is proposed to be established on disturbed areas (including the temporary topsoil stockpile and retaining structures) using the seed types and seeding rates contained in Table 2.

Table 2. Proposed Seeding Types and Rates for Reclamation

Seed Type	Seed Rate (lb/ac pure live seed)
Thick-spike or Rosanna Western Wheatgrass	4
Bluebunch Wheatgrass (If seed is not available, use Rosanna Western Wheatgrass at the same rate)	4
Nordon crested Wheatgrass	2
Clover (mixed yellow sweetclover and red clover)	1
Pubescent Wheatgrass	3
Slender Wheatgrass	1

Figure 4.

PROPOSED
RECLAIMED AREA
CONTOUR MAP

Sections 5 & 8, T6N, R4W

PLATE 3

JEANNIE S MINE

Seeding would be initiated in the first appropriate growing season following grading and topsoiling of each disturbed area. It is anticipated that seed would be drilled. If seed were broadcast, the above seeding rates would be doubled and the seed worked into the ground. Fertilizer would be applied at a rate of 175 pounds per acre of 18-24-0 at the time of seeding. This would be the equivalent of 30 pounds of nitrogen and 40 pounds phosphate per acre. An additional 30 pounds of nitrogen per acre would be applied in each of the two years following planting.

At the time of actual revegetation, coordination between the local Soil Conservation Service, and the Department of State Lands would occur to determine if current recommendations are still best suited to the area.

3. Other Considerations

1. Where operations result in a need to prevent acid drainage or sedimentation, on or in adjoining lands or streams, JSMC would provide for the construction of earth dams or other reasonable devices to control water drainage, provided the formation of such impoundments or devices shall not interfere with other landowners' rights or contribute to water pollution (as defined in the Montana Water Pollution Control Act as amended).

2. There are not natural streams or springs in the permit area. One impounding structure would be constructed.

   If additional tailings or spoil impounding structures become necessary in future years, they would be constructed with adequate spillways to protect against washout during a one hundred year flood.

3. JSMC would comply with all applicable county, state, and federal laws regarding solid waste disposal. Refuse would be disposed of in a manner that would prevent water pollution or deleterious effects upon the revegetation efforts.

4. Upon abandonment, water from the development of mining activities would be diverted or treated in a manner designed to control siltation, erosion, or other waste pollution damage to streams or natural water courses.

5. All access roads would be located, constructed and maintained in such a manner (after giving practical consideration to the effectiveness of the operation) as to control and minimize channeling and other erosion.

6. All operations would be conducted so as to avoid range and forest fires and spontaneous combustion.

7. Archeological and historical values in areas to be disturbed would be given appropriate consideration. The State Historic

Preservation Officer would be contacted as such discoveries are made.

8. Provisions would be made as far as practical to avoid accumulation of stagnant water which may serve as a host or breeding area for mosquitos or other disease-bearing or noxious insect life.

9. Final grading would be done with non-noxious, non-flammable, non-combustible solids.

10. All reasonable and proper precautions would be taken to assure that exposed cuts or overburden disposal areas would not be subject to wind erosion to the extent that air-borne detritus becomes a public nuisance or detriment to the flora and fauna of the area.

11. All refuse would be disposed of in a manner that would prevent water pollution or deleterious effects upon the revegetation effort.

12. A fence would be placed around the perimeter of the mine area to protect cattle and unauthorized persons from entering the area. Warning signs would be posted on the fence.

13. Revegetation would be accomplished in the first appropriate season after final grading is complete.

14. Contouring of each successive cut would ensure a stable drainage channel through the final reclaimed area. Final drainage channels would be as long or longer than the original channels, and shall contain meanders and pools similar to the original channels. Rock riprap should not be needed but would be used whenever appropriate and banks would be rounded to ensure a stable channel during runoff events. Revegetation efforts would be the same as for the surrounding disturbed areas.

15. Reclamation activities, particularly those relating to the control of erosion, would, to the extent feasible, be done in conjunction and simultaneously with the mining activities. JSMC agrees in the absence of an order by the Board providing a longer period, the reclamation activities would be completed within two years after any area in the Proposed Reclamation Plan becomes abandoned.

16. In the absence of emergency or suddenly threatened or existing catastrophe, JSMC would not depart from an approved plan without having previously obtained from the Department written approval of the proposed change.

4. Performance Bond

The Metal Mine Reclamation Act (Title 82, Chapter 4, Part 3, MCA) states:

> *The applicant shall file with the department a bond payable to the state of Montana with surety satisfactory to the department in the penal sum to be determined by the department of not less than two hundred dollars ($200) nor more than twenty-five hundred dollars ($2,500) for each acre or fraction thereof of the disturbed area, conditioned upon the faithful performance of the requirements of this act and the rules of the board. In lieu of such bond the applicant may file with the board a cash deposit, an assignment of a certificate of deposit or other surety acceptable to the board. Regardless of the above limits, the bond shall not be less than the estimated cost to the state to complete the reclamation of the disturbed land. A public or governmental agency shall not be required to post a bond under the provisions of this act. A blanket performance bond covering two (2) or more operations may be accepted by the board. Such blanket bond shall adequately secure the estimated total number of acres of disturbed land. When determined by the department that the set bonding level of a permit or license does not represent the present costs of reclamation, the department may modify the bonding requirements of that permit or license.*
>
> *No bond filed in accordance with the provisions of this act shall be released by the department until the provisions of this act, the rules adopted pursuant thereto and this reclamation plan have been fulfilled.*

No determination has been made at this time by the Department regarding the bonding amount that will be required from JSMC if the mining proposal is approved.

5. Alternative Mining Plan

At the time of preparation of this document, the North Boulder Drainage District and the Jefferson County Conservation District are in the secondary stages of the Boulder River Watershed Plan. This plan entails the construction of a dam near the mouth of the Little Boulder River and the corresponding acquisition of land for the reservoir and related recreational facilities. The reservoir would be used mainly for irrigating lands along the Boulder River south of Boulder, Montana.

In the event the reservoir on the Little Boulder River is built, a certain portion of the proposed mining area would be inundated. At the

present time the reservior project has not received final approval. If prior to the start of mining or during the mining operation, the reservior project does receive final approval, the presently proposed mining plan would be modified. An alternative mining plan would be submitted to DSL for approval. The major modification to the mining plan would be in the mining of the 1- to 2-acre pillar within the Chinese Diggings. With approval of the reservoir project the immediate mining of this pillar would be sought.

The creation of the reservoir would also necessitate the relocation of the planned road through the Chinese Diggings area and the relocation of the settling ponds. Since the planned road would be inundated it would be relocated to its original location. The settling ponds which would also be in the proposed reservoir site would be relocated into the cut of the mining area.

Another alteration in the mining plan would be the change of the makeup water sources for the project. The planned source is a reservoir and well which would be in the proposed reservoir site. The alternative would be to pump water from the Little Boulder River at a point upstream of the reservoir.

Currently representatives of the Jeannie S. Mining Company are in contact with the USDA, SCS and various local organizations involved with the reservoir project. These organizations have expressed an interest in possibly using some of the overburden from the mined area for fill material in the construction of the proposed dam. The Jeannie S. Mining Company will cooperate fully with these people and DSL, but until the reservoir project receives final approval and the amount of fill material and/or other cooperative measures are finalized, the proposed mining plan as set forth in the application will be followed. At such time as the approval of the reservoir project and finalization of cooperative agreements between Jeannie S. Mining Company, USDA, and local sponsors, an alternative mining plan will be submitted to DSL for approval.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT AND IMPACT OF THE PROPOSALS

A. The Physical Environment

1. Location and Description of the Area

The proposed mine permit area is located in Jefferson County, Montana. Figure 1 shows the geographic relationship of the permit area to the Little Boulder River. The proposed mine site is approximately two miles south of the community of Boulder, Montana.

2. Topography

The proposed mine site is in the central portion of the Rocky Mountain Physiographic Province. The area is part of an extensive granite intrusion that reaches northward from the highland Mountains to the City of Helena, Montana, and westward from the Deerlodge Valley to the Elkhorn Range and Bull Mountain. The proposed permit area is bordered on the north and west by the foothills and mountains of the Deerlodge National Forest (Figure 1). Figure 2 depicts the present topography of the site and the immediately adjacent areas.

The southeastern portion of the proposed permit area consists of mine tailings called the Chinese Diggings, the result of previous placer operations occuring primarily in the late 1800's. These tailings extend to the south and into the present alluvium of the Little Boulder River.

The proposed permit area is bordered on the east by low rolling hills which extend to the Boulder River Valley. Surface elevations in the proposed permit area range from 4850 to 5080 feet. Bedrock elevations in the proposed mining area range from 4880 to 4910 feet. Bedrock is primarily granite and decomposed granite while overburden consists of soils and rock derived from nearby mountains through actions of ice, water, and wind.

Placer mining of the proposed permit area would significantly alter the existing topography of the area. The existing topography of the previously unmined area (Figure 2) would be replaced by a post-mining topography consisting of a single gently sloping drainage (Figure 4). The reestablished topography would not significantly conflict with adjacent undisturbed areas. The proposed reclamation of the main overburden disposal site, however, would add topographic relief to the area in the form of a large pile of overburden approximately 45 feet high, 250 feet wide, and 375 feet long.

If relocation of the previously relocated road becomes necessary as a result of the proposed reservoir on the Little Boulder River, the overburden disposal pile could present an obstacle to the road siting. Other alternative routes for the road do appear to be available, however, regardless of the relocation route, it would be necessary to cross the reclaimed lands.

If mining is expanded to include the Chinese Diggings areas as has been suggested, the existing high cut banks along the previously mined areas would be recontoured and included in the mines reclamation plan. This would eliminate the existing conflict between the Chinese Diggings and the adjacent topography.

3. Climate

The climate of the proposed mine site is typical of southwestern Montana where local ranges of the Rocky Mountains greatly influence climatic conditions. Winters in general are cold with occasional mild periods which melt snow accumulations in the valleys. Summers are characterized by wide daily temperature variations, abundant sunshine, low relative humidity, and occasional thundershowers.

Weather records at Boulder, two miles north of the proposed permit area, are representative of the Boulder Valley. The average annual precipitation was 11.2 inches for the period 1941 to 1978. About 20 percent of the average annual precipitation occurs in June. About 50 percent of the total precipitation occurs during the period June-September (U.S. Weather Bureau, 1978).

Temperatures at Boulder vary from a record low of -39^{o} F to a record high of 105^{o} F with a mean annual temperature of 41.9^{o} f. For the hottest month, July, the average daily maximum is 81.3^{o} F and the average daily minimum is 46.8^{o} F. During the coldest month, January, the average daily maximum is 31.7^{o} f and the average daily minimum is 8.3^{o} F. The average frostfree period is 115 days between the last killing frost on about May 24 and the first killing frost on about September 15.

The mountainous areas of the Little Boulder River watershed are subject to much lower temperatures and higher precipitation than the Boulder valley. There are five snow survey stations in the Boulder River drainage. Data from these stations indicate the average annual precipitation in the upper parts of the watershed is approximately 30 inches. The snowmelt from the mountains provides most of the streamflow of the Boulder River and its major tributaries.

4. Geology

There has been a very limited amount of geologic investigation specific to the immediate vicinity of the proposed mine site. However, there are several highwall areas within the Chinese Diggings that show excellent cross-sections of the soils and overburden that would be encountered during the proposed mining operation. Approximately 50 core holes were drilled throughout the proposed mining area during exploration. Information from the driller (Wes Lindsay, pers. comm., October, 1979) indicates that the sequential geology of the holes corresponds well with the exposed highwall geology. The overburden consists of decomposed granite existing as clay or sandy clay. Beneath the overburden is a

tight clayey gravel layer containing the placer gold and beneath the gravel is bedrock consisting of granite.

5. Air Quality

Sources of pollution which affect the existing air quality of the proposed mining project area are listed below:

1) Emmision sources in the urbanized area of Boulder
2) Interstate Highway 15 two miles north of the site
3) Open burning
4) Unpaved streets and roads
5) Soils void of vegetation

The primary impact on air quality from the proposed mining operations would be an increase in suspended particulates. The main source of the particulates would be overburden and soils exposed during mining, before reclamation would be completed. Air inversions which occur in the area, particularly during the autumn and winter months, have the potential to trap the increased particulate matter from the mine and related activities, thereby reducing visibility in the area and contributing further to the adverse effects on the aesthetics of the airshed during these periods. Since little or no mining would take place during the winter months, air inversion/particulate problems would be minimized.

Appendix A contains a Preliminary Environmental Review prepared by the Air Quality Bureau of the Department of Health and Environmental Sciences for the Air Quality Permit application by JSMC. Approval of the permit is contingent upon 4 conditions:

1. Visible emissions not to exceed 20% opacity.
2. Water shall be used as a dust suppressant when necessary.
3. Chemical dust suppression shall be used on the relocated road.
4. Particulate emissions from gravel wash plant not to exceed 47.3 lb/hr.

Adherence to these conditions during the operations should significantly reduce the potential for adverse air quality impacts.

The estimated emissions associated with the mining activity from both earth moving and wind erosion are shown in Tables 3 and 4 respectively. Earth moving activities will be accomplished with 2 loaders with approximately a 7 cubic yard capacity per unit, and 2 to 3 scrapers with approximately a 28 cubic yared capacity per unit. Total use for the earth moving machinery has been estimated at approximately 3900 hrs. per year.

The Jeannie S. Mining Company is currently negotiating with experienced persons and/or firms in the project area to do the actual mining and earth moving.

Table 3. Summary of Particulate Emissions[1/] From Mining Activity - Earth Moving

Year	Cut #	Surface Area (Acres)	Top[1] Soil (yd^3)	Over-[2] burden (yd^3)	Gravel[3] (yd^3)	Est. Total Annual Emmissions[2/] (Tons)
1980	1	21	33,880	369,024	124,246	31.0
1981	2	10	16,133	496,027	121,633	34.6
1982	3	10	12,100	696,432	122,067	44.9
1983	4	9	10,890	772,925	124,556	48.9
1984	5	9	9,680	926,707	118,105	56.9
1985	6	8	7,530	967,268	99,144	58.1
1986	7	8	6,455	571,346	53,764	34.5
Totals		75	96,688	4,799,729	763,515	308.9

[1/] All emissions are uncontrolled. Compilation of past practices and interpretation by ERA Region VIII on Air Quality - Mining, December 10, 1979 (Table 1. BACT. Mining)

[2/] Top Soil Emission rate - 0.38 lbs/yd^3
Overburden Emission rate - 0.11 lbs/yd^3
Gravel Emission rate - 0.07 lbs/yd^3

Table 4. Summary of Particulate Emissions From Mining Activity - Wind Erosion[1/]

Year	Exposed Surface Area (acres)[1] Top Soil	Overburden	Gravel	Est. Total Annual Emission (Tons)
1980	2.5	30	10	25.5
1981	30	10	10	30.0
1982	10	10	10	18.0
1983	10	10	10	18.0
1984	10	10	10	18.0
1985	10	10	10	18.0
1986	10	10	10	18.0
1987	20	-0-	-0-	12.0
			Total	157.5

[1/] Emission From Wind Estimated at 1200 lbs/acre/year For All Three Types Of Exposed Surface Area.

6. Soils

A soils survey was conducted by the JSMC for the proposed permit area in November, 1979 (Figure 5). The survey was made in accordance with the Department of State Lands' Reclamation Division guidelines. The survey identified the soils of the area as primarily decomposed granite with characteristics similar to the Oro Fino Series. These are well-drained, moderately dark-colored, strongly developed soils that are usually more than 36 inches deep. They have thin (3-7") dark-colored loam or gritty loam topsoil, and a distinct to prominent zone of lime accumulation which occurs at 12 to 24 inch depths. Soil textures are loam or sandy loam with variable amounts of fine granitic gravels with some cobble and stone. These soils occupy gentle to moderately sloping fans and terraces, some of which are quite irregular. They are moderately extensive and are used primarily for grazing.

Soil types are fairly consistent throughout the mining area with expected areas of deeper topsoil in the bottoms of the undisturbed areas and thinner topsoil on the ridges.

Appendix B contains a mapping unit description for those soil units identified in Figure 5, as well as a soil analysis for each of the 4 sample sites.

In the area proposed for mining the soils would lose their identity, soil textures would be altered and soil horizonation would be lost. These impacts would be brought about by: (1) direct soil disturbance and soil compaction during removal of topsoiling materials; (2) removal of overburden; (3) soil erosion from areas during the above activities where inadequate soil erosion measures are applied; and (4) mass soil movement initiated by the above activities.

Soil disturbance as a result of mining activities would cause some decline in soil productivity, and some soil losses would occur. Soil biological activity and organic matter would be reduced and soil structure lost. This would probably cause minor changes in soil productivity and infiltration rates. However, basic soil properties necessary to sustain long-term productivity would not be substantially affected. The hauling and stockpiling of all topsoil material, and the stripping and retopsoiling in two lifts as proposed, rather than a direct placement of topsoil from an active cut to a recontoured fill, would encourage mixing of the topsoil layers. This would result in a more suitable soil texture, a dilution of any saline and sodic salts, and a lower percentage content of rock fragments, thereby increasing revegetation success.

7. Surface Water Quality

Two ephemeral drainages occur in the proposed mining area and meet at the upper (northwestern) edge of the Chinese Diggings. An impounding structure will be built that will contain the expected runoff of the 10 year - 24 hour precipitation event, from the two intermittent drainages,

Figure 5.

SOIL TYPE MAP

and store that water within the Chinese Diggings area. Total surface area of these drainages above the structure is approximately 560 acres and ranges in elevation from 4870 to 6240 feet. The 10 year - 24 hour precipitation event in and above the mining area is approximately 1.6 to 2.0 inches. This would yield approximately 24 acre-feet, using 0.2 and 0.5 runoff factors for 410 acres of undisturbed and 150 acres of disturbed land, respectively. This amount of disturbed land, however, could happen only if on going reclamation efforts were not successful. (Systems Technology Inc., 1979)

The nearest perennial stream is the Little Boulder River, located about 800 feet south of the permit area. The Soil Conservation Service (SCS) maintained streamflow records on the Little Boulder River from 1963 to 1968. During that period the average annual yield of the Little Boulder River was approximately 15,700 acre-feet. An average annual peak flow in the Little Boulder River was about 250 cubic feet per second (cfs). Minimum fall and winter flow in the Little Boulder River was about 4 cfs.

As part of a surface water quality survey by Systems Technology Inc., four sites within and adjacent the proposed mine area were sampled on October 26, 1979. Two sites were established on existing surface ponds resulting from groundwater seepage in previously mined area, one at an existing adjacent residential well between the mine site and river, and one on the Little Boulder River adjacent the mine site. The results of the analyses of these samples is contained in Appendix C. Existing water quality data from the Little Boulder River for use in comparison with the most recent sample data is very limited. Previous sampling has been limited to areas some distance below the mine site. For a more complete discussion of previous sampling results and the potential for water quality impacts, the reader is referred to Appendix C.

The proposed project would operate with a closed circuit water system. The threat for an adverse impact to the area's water quality from a planned discharge is therefore not present. If an excessive precipitation event were to cause surface waters to escape from the mine or settling pond area, these waters are not anticipated to contain toxic or harmful substances capable of significantly affecting other nearby surface waters. These waters would, however, probably contain increased amounts of sediment and dissolved solids.

8. Groundwater Quality

Exploratory drilling to bedrock throughout the proposed mining area has not revealed significant amounts of groundwater (Wes Lindsay, pers, comm October, 1979). Several seeps and small ponds exist within the Chinese Diggings. The total groundwater discharge to surface waters in the permit area is estimated at less than 15 gpm.

Appendix C contains the results of an analysis of the groundwater from a domestic water well between the proposed mine site and the Little

Boulder River. The analysis indicates that groundwater in the vicinity of the proposed mine site is moderately hard, and low in nutrients and metals concentrations.

In July, 1978 a sample of the Boulder River School Well No. 1, 1 mile to the north, was taken. This data also is listed in Appendix C and shows dissolved salt concentrations are low and similar in composition to surface waters. Metals concentrations are very low, generally below detection limits.

Percolation of the mine's washwater with its increased dissolved solids to groundwater flows should not result in a decrease of the existing groundwater quality (Appendix C).

B. The Biological Environment

1. Flora

Preliminary field observation of vegetation in the mining area indicates that the general range condition is fair. An abundance of increaser and invader plant varieties indicate heavy grazing in the past. A tentative list of plants that were identified in late July, 1979 is provided in Appendix D. It is likely that there are several additional species in the area that were dormant or unidentifiable.

The present vegetation community on undisturbed rangeland is bluebunch wheatgrass needle and thread. This community ordinarily contains big sagebrush, several wheatgrasses, prairie junegrass, and forb increaser species under climax conditions. As a result of past grazing, there is now a larger percentage of invader and increaser species, and the general range community has a slightly higher than normal amount of needle and thread grass.

Although much of the Chinese Diggings area is barren piles of washed gravel and cobble, natural revegetation has occurred throughout the area. The reestablished vegetation community consists primarily of cottonwood and douglas fir trees, willow, aspen, and a number of forbs adapted to the higher moisture conditions. In addition, bluegrass, wild rose, and sweetclover have become established in some areas. Cattails and other aquatic species occur along the perimiter of the several small ponds in the previously mined area.

The major impact to the flora, although not considered significant, would be the destruction of vegetation in all disturbed areas of the proposed operation during the six or seven year life of the mine, and the reestablishment of an altered vegetation community.

The proposed reseeding mixture does not contain any shrubs or forbs, which presently occur over much of the proposed mine site. Reclamation of the mined area would be limited to grasses. As a result, the vegetation of the reclaimed area would not be as diverse as prior to

mining. In addition, both yellow sweetclover and pubescent wheatgrass are highly competative and may further reduce the diversity of the reestablished vegetation.

Undesirable invader species, will also probably proliferate on disturbances caused by the operations and, although they will have the beneficial aspect of holding soils and building soil organic matter, they have the detrimental properties of competition with more desirable species and propagation of a seed source for further distribution.

Native vegetation and reclamation areas in the vicinity of the mining area, overburden disposal areas, soil stockpiles, facilities and along roads will be affected by dust. Dust caused by these activities will affect vegetation to an unknown degree. It is expected that dust from all operations will not be significant enough to cause serious damage.

2. Terrestrial Fauna

Wildlife information for the proposed mine site was obtained from a report compiled by the U. S. Fish and Wildlife Service for the Boulder River Watershed (North Boulder Drainage District, 1976). The analysis of potential impact to wildlife species as a result of the proposed mining project is based upon the limited wildlife use data contained in the USFWS report, and is not considered conclusive, but rather based upon the best information currently available. No specific fish or wildlife survey information is available from the Department of Fish, Wildlife and Parks (Appendix E).

The Boulder River Valley and surrounding mountains provide good wildlife habitat. Elk and mule deer winter in the foothills along the Little Boulder River. The proposed mine site receives considerable use by mule deer and possibly occassional use by Elk over several seasons during the year. Precise information on the time and nature of use is not available (Appendix E). The area of the mine site west of the existing access road provides the most evidence of mule deer and elk use. An excellent population of whitetail deer occurs along the main stem of the Boulder River and may range up the Little Boulder River to the vicinity of the proposed mine. Some pronghorn antelope are found over the adjacent rangeland and irrigated areas where they provide some limited hunting.

Sharp-tailed grouse, gray partridge, and ring-necked pheasant frequent the adjacent cultivated land, while a few mallards nest along the Little Boulder River. A wide variety of song birds occupy the diverse vegetation community that has become establised on the previously mined area east of the existing access road.

Seep areas within the Chinese Diggins have small ponds associated with them, and provide suitable habitat for several species of amphibians and reptiles common to the area.

Numerous other wildlife species such as bobcat, coyote, cottontail rabbits, jackrabbits, and other small rodents are found throughout the area. No rare or endangered species are known to reside in, or utilize the proposed mining area (Appendix E).

Although wildlife use data is not available for the proposed mine site or adjacent areas, it is doubtful that the increase of human and equipment activity associated with the new mine would represent a significantly disruptive impact on wildlife use of the area. Those species residing directly within those lands proposed to be disturbed, however, would be either displaced or be subject to disturbance related mortality during the seven year life of the operation. Successful reclamation during and following the completion of mining would again provide for the continued use of the area by wildlife.

3. Fisheries

The proposed mine site does not contain habitat suitable for the existence of a fishery. The Little Boulder River adjacent to the mine site, however, has numerous beaver ponds that provide favorable habitat for several species of trout. The Little Boulder River contains populations of mountain whitefish, brown trout, rainbow trout, brook trout, white sucker, mountain sucker, dace, and mottled sculpin. No information regarding the status of these populations is available.

It is not anticipated that the proposed mining project would adversely affect the existing fishery of the Little Boulder River. All surface drainage from the proposed mine site would effectively be confined by the proposed settling ponds and access road berm.

C. The Social and Economic Environment

1. Land Use

Land use in the proposed permit area presently includes seasonal open grazing by livestock, wildlife habitat, and limited amounts of small scale placer mining. Land adjoining the proposed permit area to the north is owned by the State of Montana and is used for solid waste disposal by Boulder and nearby residents through a lease agreement. Land bordering to the west is owned by the U. S. Government and administered by the BLM for grazing. The remainder of the adjoining lands are privately owned and are used primarily for grazing and minor amounts of placer mining. The existing road through the proposed permit area provides public access to the upper Little Boulder River watershed for recreational activities.

A small part of the lower watershed (218 acres) consists of lowlands of the Little Boulder flood plain which are presently used for pasture and hayland. In the past, a portion of the proposed permit area was hydraulically mined for gold and is unreclaimed. Some small placer mining occurs in the previously mined area.

If the proposed mining project is approved, the permit area would be fenced to assist in revegetation efforts and to aid in safety promotion. Access to the mine area by livestock, larger wildlife species, and recreationalists would be restricted. Access to the upper Little Boulder River watershed by recreationalists, however, would continue along the relocated road. The proposed reclaimed use of the project area would be grazing by livestock, and wildlife habitat. Reclamation, if successful, would limit the use of the 157 acres of permit area for these activities for the duration of the project.

2. Income, Employment, and Taxes

The proposed mining and associated washing operation would operate on a 7-day week schedule for about 200 days per year, ceasing during the winter season. It is anticipated that overburden removal would occur during daylight hours, while the washing plant would operate 24 hours per day. Approximately 5.8 million yards of overburden and gravel would be moved over the life of the operation.

The operating crew would consist of eight to twelve persons, comprising two or three shifts. It is proposed that at least half of the personnel would be hired locally. Wages would be comparable to those paid for local heavy equipment operators. Estimated wages would amount to approximately $150,000 annually and be subject to state and federal income taxation.

The majority of the earth-moving equipment would be obtained through local contractors, and would not generate additional tax revenue. Newly purchased equipment would include the wash plant and one large front-end loader with a total value of approximately $300,000. Office and maintenance buidlings would be located on the permit site and would cost approximately $90,000.

Core drilling has indicated the extent of the placer deposits and the approximate gold concentrations. Over the life of the operation it is anticipated that gross revenues would be $10,000,000 if the price of gold averages $250 per troy ounce. Fluctuations in the price of gold over the seven year life of the operation could result in a substantial increase in the projected gross revenues from the project. Economic feasibility of the mining operation, however, could be reduced if the price of gold declines much below $250 per troy ounce for a significant period of time.

There are four separate taxes in Montana which would apply directly to the proposed JSMC mining operations. These include the Property Tax, Gross Proceeds Tax, Resource Indemnity Trust Tax, and the Corporation License Tax:

1. Property Tax - A county-wide mill levy of 245.39 would be applied to the taxable valuation of the mining equipment owned by the company and any buildings or improvements that

occur on the property. It is estimated that the Property Tax for the JSMC properties would be approximately $9,050 annually.

2. Gross Proceeds Tax - The Gross Proceeds Tax functions as a property tax on minerals extracted from a county. A county-wide mill levy of 245.39 mills would be applied against the taxable value of mine production. This taxable value represents 3 percent of the merchantable (market) value of the mineral. It is estimated that the Gross Proceeds Tax of the JSMC operation would be approximately $10,512 annually.

3. Resource Indemnity Trust Tax - The purpose of the Resource Indemnity Tax is to make money available to improve the total environment and rectify damage caused by past mining operations. The tax is applied to all mining activity in the state. Its rate is one-half of one percent of the gross value of a mine's production. It is estimated that the Resource Indemnity Trust Tax would be approximately $7,140 annually.

4. Corporation License Tax - The Corporation License Tax is in reality a corporate income tax levied by the state. The license fee is derived as a percentage (6.75%) of a corporation's annual net income. Revenue generated by the tax is allocated to the state's general fund. Information regarding the anticipated annual net income of the JSMC operation indicates that the Corporation License Tax would be approximately $16,875 annually.

Failure to approve the proposed project would result in a loss of those potential taxation revenues and personal salaries identified above. It is not anticipated that approval of the project would result in a need for increased community or county services.

3. Human Health and Safety

The proposed mine operations may produce additional dust particulate. The influence of dust, as a contribution to respiratory diseases and ailments of the human population in the immediate vicinity of the proposed operation, is not considered significant. Dust abatement and proper management of the exposed soil materials in the stockpiles should mitigate this potential health hazard.

The proposed mine and stockpile area may also constitute an "attractive nuisance" in the area and could cause injury or loss of life to individuals who trespass into the mine area during the life of the proposed operations. To assist in revegetation efforts and to aid in safety promotion, the permit area would be fenced to further restrict access to the area by both livestock and people.

Transporatation of the concentrated placer gold will occur approximately once per day. Gold transport plus vehicle traffic related to mine operating employees would result in an insignificant increase in traffic

on the present access road. The estimated increase in traffic would be less than 15 vehicles, arriving and departing the permit area, over a 24-hour period.

Noise levels in areas adjacent to the mine site would increase as a result of the operation of large earthmoving equipment necessary in the mine operation. the lack of residences in close proximity to the mine would mitigate the significance of the increased noise levels.

4. Archeological and Historical Sites

A cultural resource inventory of the proposed mine site was conducted on October 26, 1979 by the Cultural Resources Division of the Mineral Research Center, Butte, Montana.

a. Historical Development

The Chinese Diggings and the immediate vicinity on the Little Boulder River have had a long and complex history of exploitation through placer mining. The original name for this area along the Little Boulder River was the Peru Bar (Wegener, 1979, personal communication).

There have been four periods of historical placer mining activity in the Chinese Diggings area. They are listed as follows:

I. 1863-1890 - White prospectors, placer mining, ranch and water rights claims filed, placer mining claims filed.

II. 1892-1904 - Chinese engaged in placer mining on leases from the white claim owners.

III. 1912-1945 - Chinese Diggings reclaimed, refiled on, part of them purchased by Dr. T. C. Witherspoon of Butte, Montana (extensive test drilling).

IV. 1945-present- Chinese Diggings purchased by Mr. Peter Wegener of Boulder, Montana, claims subsequently developed by Mr. Wegener who is now leasing the ground to the Jeannie S. Mine Company.

The report by the Mineral Research Center is on file in the Department's Helena Office and contains a comprehensive documentation of the historic development of the area of the Chinese Diggings. The reader is referred to this document for further historic information.

b. Cultural Survey

The project area and adjacent roads were systematically walked in search of cultural materials. Cutbanks were examined for cultural stratigraphy or features. Six inch diameter metal pipes had been embedded

in the ground throughout the area to aid in tracing subsurface gold-bearing rock layers. The areas around the metal pipes were checked for subsurface material that might have been brought to the surface during the drilling process. Rodent diggings were perused for cultural materials. Two prominent or primary sites and one historic indistinct site were recorded on the project area.

The area within the Chinese Diggings (24JF290) would be disturbed and receive impact from the proposed mining operations. This site, however, has been severely eroded and the remaining mine shafts, and historic refuse has little integrity. The importance of the Chinese Diggings lies in its archival values rather than the physical remains. No further mitigation efforts were recommended at this location. Unless further future research deems the site otherwise, the Chinese Diggings do not meet the criteria for nomination to the National Register.

An unimpacted Ring (24JF291) and indistinct site (79-JSM-1) identified during the survey are outside of the area of direct and projected indirect impact from proposed mining operations. 24JF291 is a single stone circle site and does not meet the criteria for nomination to the National Register. The indistinct site consists of three rock piles thought to be mining claim markers. The recording of these features effectively mitigates this site.

Although no sites in the township (T5N R4W) have been nominated to the National Register of Historic Places, a historic stage station (24JF58) was located and research conducted. Ten other prehistoric and historic sites are recorded in the township, including circles and lithic scatters. The Statewide Archeological Survey by the University of Montana conducted investigations of the stage station and an area near the mouth of the Little Boulder River.

5. Visual Resources

The existing visual resources of the permit area are influenced by the previously mined Chinese Diggings area. The area, however, is not considered to contain any unique or limited visual resource.

During operation of the mine, the existing visual resource of the area would be altered by the open cuts, soil stockpiles, and general heavy equipment presence and related disturbances. Following successful reclamation, the visual resource of the area may be improved as a result of the recontouring and revegetation of the Chinese Diggings area. The relocated access road would provide an unobstructed view of the mining operation, although the mining operation would be less obvious from the major transportation routes nearby. View of the mine site from the nearest residences would be limited and is not considered to be significantly adverse or long-term.

6. Recreation

The proposed mine site is privately owned and is not presently used for recreational purposes. The relocation of the mine access road would

continue to provide access to the upper Little Boulder River watershed for recreational purposes by the public.

D. Significant Adverse Impacts that Cannot be Avoided if the Proposals are Implemented

The major adverse impact that cannot be avoided is the creation during the life of the operation of an open-pit mine and associated stockpiles on an area that is presently undisturbed by development. For those individuals who consider the presently undeveloped state of the land an important natural amenity, the mining operation would represent a significant adverse impact during its operation and possibly beyond, since the existing topography cannot be reestablished following completion of the project.

E. Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed activities would result in a permanent change in topography at the mine site, thereby introducing long-term changes in related environmental factors affecting long-term productivity of the area. Changes in slope magnitude and slope aspect or direction would alter the local microclimate, producing corresponding changes in type, density and vigor of the plant cover. This in turn would affect infiltration, runoff, erosion and sedimentation, and productivity or carrying capacity for wildlife.

The proposed mining activities, would increase the total suspended particulate levels in the air during the development and operation of the project. The cessation of this activity and successful reclamation would end the impact on air quality directly related to the project.

The proposed mining activity represents a short-term productive use of the mineral reserves. The long-term effect on the productivity of the locatable mineral resource present will be a decrease in productivity until the mineral resource of the mine is totally depleted.

Soil disturbances as a result of the proposed action would alter soil characteristics and probably cause some long-term decline in soil productivity. Soil losses would occur from accelerated erosion on denuded and disturbed areas during operation and reclamation. Also, organic content and biological activity in the replaced surface layer would be temporarily decreased by mining soil and by stockpiling. Although there may be some minor changes in the soil productivity, permeability, infiltration and depth, the basic soil characteristics would be present to sustain the long-term productivity of the soils.

The short-term use of the land for mining could result in a long-term reduction of biological productivity depending on the success of reclamation. If care is taken to salvage and replace all available topsoil, prevent erosion, and establish grasses, forbs, and shrubs

adapted to the sites, post-mining biological productivity should eventually approximate existing productivity. Species diversity will remain low after reclamation until natural reinvasion can increase the number of species occurring on the revegetated areas.

On a site-specific basis, the short-term use of the land to mine minerals is a disturbance that will result in the long-term alteration of wildlife habitat on the areas to be disturbed. The alteration, however, is not anticipated to significantly affect existing wildlife use of the area.

Jefferson County's economic environment would undoubtedly receive direct stimulation through additional employment and mining production as a result of the proposed operation.

The archeologic and historic survey of the proposed permit area offered a short-term use of these resources. Long-term use of these resources is the record of this statement, and the report by the Mineral Research Center which contains maps of the survey area and sites and historic finds.

F. Irreversible and Irretrievable Commitment of Resources

The proposed mining activity would irreversibly commit the entire placer gold deposit within the permit area to depletion. Mineral deposits are unique, highly finite and valuable features of the earth's crust, formed by slow processes still active today. Mining of the mineral resources is a depletion of a resource that will require millions of years to be replenished, possibly never (localized) in the same area.

The land itself may be committed to other uses as a result of its initial commitment to the proposed action. Other uses for the mine may be identified and this could delay or halt full restoration of the mined area.

The proposed placer mining of gold and the reclamation of disturbed areas at the proposed mine site would require the use of liquid fuels in the form of diesel fuel and gasoline, electrical power, and structural and repair materials. In addition to fuel and explosives, an unquantifiable amount of materials used in the mining and subsequent reclamation processes would also be irretrievably lost for other uses.

Unless the mine area and all associated facility sites are reclaimed to their condition prior to disturbances, the potential for reduced carrying capacity must be considered a partial irretrievable commitment of the wildlife resource.

The capital investment in plant and productive equipment at the mining termination is irretrievable and irreversible once commited, if no alternate usage can be found. Labor invested in mining is irretrievable once expended, but the labor commitment is reversible should a

premature termination occur. Similar commitments and investments on a smaller scale may develope in the government, trade and service sectors of the local economy with congruent irreversible and irretrievable outcomes.

Such an investment and commitment of human and economic resources is required for any economic activity. But unless the venture fails, this is a beneficial and necessary application of resources to continue employment and expand sources of personal income.

Archeological and historical sites or artifacts are nonrenewable and hence long-term resources. In the event that significant sites are not discovered and are destroyed during the mining process, the physical resource loss would be irretrievable. In addition to such a possible loss of physical resources, educational and scientific information regarding prehistoric environments and our cultural heritage would also be lost to both present and future generations.

III. MITIGATING OR COMPENSATING MEASURES

Three basic types of mitigating measures have been recognized as relative to the Jeannie S. Mine Company (JSMC) proposal. They are: (1) measures required by Local, State, or Federal laws, regulations, or executive orders; (2) measures proposed by JSMC as part of their mining and reclamation plan; and (3) other measures generally thought to have merit. The first two categories include those measures that are binding and must be implemented upon approval of the proposal and issuance of the various agency permits associated with the mining proposals. By attachment of stipulations, other measures comprising the third category may be required as part of the companies' reclamation plans in those instances where the permitting State or Federal agencies have the authority to do so. Inclusion of these other possible measures in the environmental impact statement affords a practical means of utilizing the expertise of agency members to identify additional measures that, if implemented, would further reduce adverse impacts of the proposal. Inclusion of these other mitigating measures in this statement in no way obligates JSMC or restricts the decision-making prerogatives of the State regulatory agencies.

A. Laws and Regulations

1. General Statement

The proposed mining operation must comply with all applicable regulations of Federal, State, and County agencies including:

Mine Safety and Health Administration
Montana Department of State Lands
Montana Department of Health and Environmental Sciences
Montana Department of Natural Resources and Conservation
Jefferson County, Montana

Regulations enforced by the above agencies are variously designed to assure realization of the full and best interests of the public, to adequately protect the environment, and to achieve continuing highest productive use of the land consistent with surrounding land uses and management objectives.

2. State Laws

Significant State Laws for mitigating impacts include:

(a) Montana's Metal Mine Reclamation Act defines reclamation requirements necessary for Departmental acceptance of the applicants reclamation plan, as well as other mitigating measures including accomplishment of specific activities, inspections of mining sites to determine compliance with the reclamation plan, performance bonds, and an annual report of activities by the permittee. In addition, all fees, fines, penalties, and other uncleared moneys which have been or will be paid to

the Department of State Lands under the provisions of this part shall be placed in the earmarked revenue fund in the state treasury and credited to a special account to be designated as the hardrock mining and reclamation account. This account shall be available to the Department by appropriation and shall be expended for the research, reclamation, and revegetation of land and the rehabilitation of water affected by any mining operations.

(b) Montana's Clean Air Act (Title 75, Chapter 2 MCA) and administrative rules adopted thereunder (Subchapter 1 of Chapter 14, Title 16, Montana Administrative Code) defines air pollution and provides for enforcement and control of those activites exceeding appropriate air quality standards.

(c) The State Antiquities Act, (Title 22, Chapter 3 MCA) which is administered by the Board of Land Commissioners and the Montana Historical Society, provides for the registration and protection of historic, prehistoric, archeologic, paleontologic, scientific, or cultural sites and objects on state lands. It also provides that the Department is authorized to enter into cooperative agreements with private landowners to preserve, mark, maintain, excavate, or otherwise deal with such sites and objects upon such terms as may be agreed upon.

3. Federal Laws

The mining companies must comply with standards and guidelines established by the Mine Safety and Health Administration to protect the health of employees involved in the mining process.

4. Jefferson County Laws

a. Property and Gross Proceeds Taxes

The facilities, including equipment and land of the proposed mining project would be subject to a property tax levied by Jefferson County. The proceeds primarily would help fund elementary school district 7, high school district 1, and Jefferson County. The gross proceeds tax is in effect a property tax on a mineral resource. It would be based on the dollar value of the mineral extracted from the mine in any given year.

5. Local Ordinances

There are no significant local ordinances that would function to mitigate impacts from the proposed mining projects.

B. Reclamation Plans and Additional Mitigating Measures

The reclamation plans proposed by Jeannie S. Mining Company are presented in Chapter One. In addition, the following section contains those mitigating, compensating, or monitoring measures generally thought to have merit by the Department.

Among those measures considered as mitigation are those that involve the implementation of a different or varient plan of operations. Technologic alternatives and their possible application to the proposed mining project are contained in Chapter Four.

1. Topography

General mitigation of impacts to existing topography would include the reestablishment of a post-mining topography that most closely resembled the pre-mining topography.

In addition, the previous mining activity in the Chinese Diggings has altered the native topography and resulted in high cut banks along its perimeter. If these areas are not mined, the cut banks could be regraded and the area incorporated into the post-mining contours proposed for the mined area. This would reduce the contrast between the area proposed to be mined and the previously mined area that would exist following reclamation of the project.

2. Air Quality

The operator should utilize, at a minimum, the following additional methods to control dust:

1) Reduce vehicle speeds,
2) load trucks in such a manner that topsoil or overburden would not be lost to create additional dust on the road surface,
3) curtail the use of haul roads during unfavorable meteorological conditions if haul roads become significant sources of dust,
4) use of equipment present on the site to clear haul roads if dust producing material, such as spilled overburden materials, presents a hazard to air quality.

3. Employee Health and Safety

Under provisions of the Federal Metal and Nonmetallic Mine Safety Act of 1966 (Public Law 89-577), MESA is responsible for the enforcement of the health and safety standards prescribed to protect the workers at all mine sites. With the signing of the Federal Mine Safety and Health Act of 1977 (Public Law 91-173), it became the responsibility of the Secretary of Health, Education, and Welfare and the Secretary of Labor to develop and promulgate improved health and safety standards for persons working at mining properties. New and/or revised regulations will be implemented by the Mining Safety and Health Administration (MSHA) under the Department of Labor.

4. Soils

a. Mine Facility Sites

In all areas to be disturbed as a result of the proposed mining operation, all suitable topsoiling materials should be salvaged and stockpiled.

Stripping of topsoil for stockpiling will require equipment operators to use caution and personal judgement to avoid salvage of unsatisfactory materials. Equipment operators should be made aware of this.

b. Roads

The relocated access road will be constructed according to county standards with regard to side and back slopes which include sloping, grading and seeding. The potential for erosion and sedimentation can be further reduced by:

1) reducing road grades wherever possible,
2) installing cross-drainages in areas with erodible soils and steep grades,
3) restricting wet-weather road construction, particularly on poorly drained erodible soils,
4) avoiding roads in areas of extreme wetness.

5. Water Resources

Proper management of the settling ponds and retention ponds would reduce the need for additional amounts of makeup water from other sources. Special care should be taken to reduce erosion causing activities and spills of equipment fuels, oils, or lubricants that could foul the surface waters used for the wash plant.

6. Flora

The following measures should be considered in addition to the reclamation requirements of the Montana Metal Mine Reclamation Act and should provide mitigating measures enhancing revegetation success:

1) Suitable species present in the proposed disturbed areas, including shrubs, should be selected, when available, for use in reclamation. These species have demonstrated the capability to survive the climatic vicissitutes and site characteristics of the area.

2) A seeding mixture as presented below would increase the diversity of the reestablished vegetation and also increase the potential for revegetation success:

Species	Seeding Rate
Canada Bluegrass	2 lbs/ac.
Thickspike Wheatgrass	4 lbs/ac.
Western Wheatgrass	4 lbs/ac.
Cicer Milkvetch	1 lb/ac.
Red Clover	0.5 lbs/ac.
Green needle grass	3 lbs/ac.
Slender Wheatgrass	2 lbs/ac.
Blue Bunch or Beardless Wheatgrass	4 lbs/ac.
Total	20.5 lbs/ac.

3) Broadcast seeding rather then drilling seed would increase revegetation success because of the wide variation of seed sizes involved in the reseeding proposal.

4) Selective seeding of the various areas of the reclaimed site with specific species would encourage diversity and vigor of the re-established vegetation.

Mitigation of potential impacts to vegetation is linked closely with the successful mitigation of the impacts to the soils resource identified previously.

7. Terrestrial Fauna

A direct relationship exists between the amount of land disturbed as a result of development and the impacts of such disturbance upon wildlife. A concientious effort to disturb as little land as possible would have the most immediate and long-lasting mitigating effects.

8. Social and Economic

a. Land Use

The responsibility for ascertaining the needed and desirable land use patterns for the proposed mine site area lies with the county government and local citizens. The communities are small enough that a town meeting approach to needs, desires and anticipated problems possibly caused by opening of the mine is still a viable approach. Leadership for continuing this process could be assured by either the Jefferson County Planning Board or by residents of the area.

b. Public Health and Safety

Those measures previously identified as reducing the amount of dust and other particulates associated with the project would likewise apply to reducing the risk of adverse affects upon the health of workers and residents cuased by these agents.

Because the proposed permit area encompasses an access road presently used by residents of the area, adequate posing of the permit area to alert travelers to the mining operation and other measures necessary to protect the general public or other users of the road should be taken.

c. Visual Resources

Those measures identified previously to reduce the dust associated with the mining activities would reduce the adverse visual impact related to increased dust levels.

IV. ALTERNATIVES TO THE PROPOSED ACTION

A. Administrative Alternatives Available to State Agencies

1. Department of State Lands

a. Approval of the operating permit for the life of the operations on the bonded acreage under the provisions of Section 82-4-337(2)(3) of the Metal Mine Reclamation Act.

(1) Require a performance bond under the provisions of Section 82-4-338 of the Metal Mine Reclamation Act.

(2) Suspension of the permit under the provisions of Section 82-4-362 of the Metal Mine Reclamation Act.

b. Denial of the operating permit under the provisions of section 82-4-351 of the Metal Mine Reclamation Act.

2. Department of Health and Environmental Sciences

a. Air Quality Bureau

(1) Approval of the Air Quality Permit under the provisions of 16-2.14(1)-S1415(7) of the department's rules and regulations adopted pursuant to the Montana Clean Air Act (Title 75, Chapter 2, ARM).

(2) Denial of the Air Quality Permit under the provisions of 16-2.14(1)-S1415(8) of the department's rules and regulations adopted pursuant to the Montana Clean Air Act.

(3) Waiver of Air Quality Permit Information needs under the provisions of 16-2.14(1)-S1415(12) of the department's rules and regulations adopted pursuant to the Montana Clean Air Act.

B. Alternative Technology

1. Underground Mining

Underground mining is not considered an economic alternative because of additional costs, and the increased difficulty in recovering an acceptable percentage of the placer gold. In addition, the overburden consists of 30 to 100 feet of decomposed granite that is relatively unstable and would require continuous support. Safety of personnel would become an increased concern compared to surface mining.

2. Alternative Surface Mining Methods

a. Overburden Removal by Dragline

The use of a small dragline is a feasible alternative to overburden removal by scraper and loader. The applicant's lack of familiarity with the operation of dragline equipment and the lack of local availability limit the consideration of dragline use for the JSMC mining proposal.

b. Overburden Transport by Conveyor System

A conveyor system could be used in place of scrapers and loaders to transport the overburden to the stockpile areas. Loaders and/or scrapers would continue to be required, however, to remove the overburden from the placer deposit. The conveyor system could be electrically powered and would represent a favorable conservation of petroleum based fuels, in addition to a potential reduction of dust emissions caused by transport by scrapers and loaders.

c. Direct Topsoil Replacement

Topsoil removed from the successive cuts could be spread directly upon the previous cut and recontoured areas without first being stockpiled. This procedure would conserve fuel normally used by the scrapers to haul and stockpile the topsoil.

Although the direct placement of topsoil is feasible, it is not considered the most advantageous method for improving the potential for successful reclamation. The soil survey of the mine area identified some areas of poor soils that could limit revegetation if replaced directly on a previously cut and recontoured area. The soil types in the mine area occur primarily perpendicular to the direction of the proposed mining cuts. Because of this, stockpiling of the topsoil prior to its placement on the recontoured cuts should result in a beneficial mixing and dilution of any limiting soils.

d. In-Cut Water Supply

Rather then a single settling pond/reclaim water pond in the Chinese Diggings area as proposed, a similar pond could be constructed in each cut area as the mining progressed. These ponds would progress with the mining and be reclaimed as each cut is refilled with overburden. Although possible, this type of ponding procedure has several limitations.

The primary limitation is the periodic need for reconstructing the pond as mining continues. In addition, the uncertainty regarding the ability of groundwater seepage to provide the entire amount of water necessary for the wash plant could require the transport of makeup water to the ponds. The proposed plan for a single reservoir that would provide a surge capacity to the wash plant is considered a more efficient method of assuring the required volumes of water than is the in-cut pond alternative.

If the North Boulder Drainage District dam and reservoir are constructed (see Chapter 1) the applicant has indicated that because of a facility conflict, an alternative ponding plan may be necessary and would most probably involve some type of in-cut water ponding proposal.

V. CONSULTATION AND COORDINATION WITH OTHERS

A. Development of Statement

This environmental impact statement was prepared by the Montana Department of State Lands. Major inputs were provided by the following:

State Agencies
Montana Department of State Lands

Ralph Driear - Environmental Administrator
Bob Spinney - Asst. Environmental Coordinator
Craig Howard - Vegetation Specialist
Harry Keltz - Air Quality Specialist
Neil Harrington - Soils Specialist
Steve Anderson - Hard Rock Mine Inspector

Private Organizations
Systems Technology Inc.

Additional participation and assistance were obtained from several sources. Jeannie S. Mining Company provided data and information on its proposed activities, as well as several visual aids.

B. Review of Statement

In accordance with U.S. Council of Environmental Quality and Montana Department of State Lands rules and quidelines, copies of the draft statement are being made available to the public for their comments and suggestions.

References

North Boulder Drainage District. 1976. Boulder River Watershed Plan and Environmental Impact Statement, Jefferson County, Jefferson Valley Conservation District.

Systems Technology Inc. 1979. Hard Rock Mining Application and Environmental Review for the Jeannie S. Mine. Helena, Montana.

U.S. Weather Bureau, 1978. Climatological Data Annual Summary for Montana. National Climatic Center. Asheville, North Carolina.

Wes Lindsay, pers. comm., October, 1979. Lindsay Water Well Drilling. Clancy, Montana.

Appendix A. Department of Health and Environmental Sciences, Air Quality Bureau Air Quality Permit and Preliminary Environmental Review (PER).

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601
Environmental Sciences Division
Air Quality Bureau
Cogswell Building
(406) 449-3454

A.C. Knight, M.D., F.C.C.P.
Director

PRELIMINARY DETERMINATION
ON PERMIT APPLICATION

January 25, 1980
Date of Mailing

Name of Applicant Jeannie S. Mine Company

Source Earth moving, dryland placer operation

Location Sec. 5,8,9, T5N, R4W, Jefferson County

Proposed Action:

The Bureau proposes to issue with conditions the permit to the above named applicant. The application was deemed complete and filed on December 7, 1979 and given number 1451.

Proposed Conditions if any:

1. Visible emissions not to exceed 20% opacity.
2. Water shall be used as a dust suppressant when necessary.
3. Chemical dust suppression shall be used on the relocated county road.
4. Particulate emissions from gravel wash plant not to exceed 47.3 lb/hour.

Public Comment:

Any members of the public desiring to comment must submit such comments in writing to the Bureau at the above address. Comments may address the Department analysis and determination information submitted by the applicant. In order to be considered, the comments must be received within 15 days of this notice, February 9, 1980. Copies of the application and the Department analysis may be inspected at the Bureau's office in Helena or at N/A.

Final Action:

A final decision must be made within 60 days of filing, which is 2-12-80. The Bureau will make a final decision on the application on February 12, 1980. A copy of the final action may be obtained at the above address from JoAnn Vorozilchak.

Procedures for Appeal:

Any person jointly or severally adversely affected by the final action may request a hearing before the State Board of Health and Environmental Sciences. Any appeal must be filed within 15 days after the Department renders its final decision. The request for hearing shall contain an affidavit setting forth the reasons for the request and any hearing held will be held under the provisions of the Montana Administrative Procedures Act. Three copies of any requests for hearing should be addressed to: Chairman, Board of Health and Environmental Sciences, Cogswell Building, Helena, Montana, 59601.

EEO/AFFIRMATIVE ACTION AGENCY

cc: Dick Karp

PRELIMINARY ENVIRONMENTAL REVIEW

Department of Health and Environmental Sciences

Division/Bureau: Air Quality Bureau

Project or Application: Jennie S. Mine Company

Description of Project: Dryland Placer - Topsoil and overburden removal, Gravel washing, replace gravel, overburden, topsoil, reclaim area.

POTENTIAL IMPACT ON PHYSICAL ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Terrestrial and aquatic life and habitats		X				
2. Water quality, quantity and distribution			X			
3. Geology and soil quality, stability and moisture			X			
4. Vegetation cover, quantity and quality		X				
5. Aesthetics	X					
6. Air quality		X				
7. Unique, endangered, fragile, or limited environmental resources					X	
8. Demands on environmental resources of land, water, air and energy			X			
9. Historical and archaeological sites					X	

POTENTIAL IMPACTS ON HUMAN ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Social structures and mores			X			
2. Cultural uniqueness and diversity			X			
3. local and state tax base and tax revenue			X			
4. Agricultural or industrial production			X			
5. Human health			X			
6. Quantity and distribution of community and personal income			X			
7. Access to and quality of recreational and wilderness activities			X			
8. Quantity and distribution of employment			X			
9. Distribution and density of population and housing			X			
10. Demands for government services			X			
11. Industrial and commercial activity			X			
12. Demands for energy			X			
13. Locally adopted environmental plans and goals				X		
14. Transportation networks and traffic flows			X			

Other groups or agencies contacted or which may have overlapping jurisdiction. Individuals or groups contributing to this PER: Dept. of State Lands

Recommendation concerning preparation of EIS: None required

PER Prepared by: JoAnn Vorozilchak

DATE: January 24, 1980

ESD-1

PHYSICAL ENVIRONMENT

Terrestrial and aquatic life and habitats

During the life of the mine, grazing on the minesite will be disrupted. This is a short term impact because the area will be reclaimed to grazing. The noise and movement of the earth moving equipment may also disrupt terrestrial habitat in the vicinity of the mine.

Vegetative cover, quantity and quality

During the lifetime of the mine, vegetative cover will not exist on the active mining and processing areas. Reclamation is to be completed within two years of cessation of mining. Temporary vegetative cover will be established on the topsoil stockpiles to prevent wind erosion.

Aestetics

Mines are not aesthetically pleasing unless one is interested in such an operation. The Jeannie S. Mine is removed from the highway and with good dust control should not be obvious to the casual transient. A county road providing access to National Forest land currently runs through the proposed mine area. It will be relocated and will provide a view of the operation.

Air Quality

Since particulate emissions from scraper operations are not controllable, the local air quality will deteriorate. The deleterious effect should not continue after reclamation is successfully completed. The air quality would return to its pristine condition.

HUMAN ENVIRONMENT

Unique, endangered, fragile or limited environmental resources

There are no known unique, endangered, fragile or limited environmental resources in the area of the mine. If such are encountered during mining, a decision on how to minimize damage would have to be made at that time.

Historical and archaeological

There are no known historical and archaeological sites in the area of the mine. There remains a possibility of finding subsurface sites during mining. Work would cease and the state historical preservation officer would be called in.

Permit No. 1451

AIR QUALITY PERMIT APPLICATION FOR SOURCES OF AIR POLLUTION
Montana State Department of Health and Environmental Sciences
Air Quality Bureau
Helena, Montana 59601 Phone: 406-449-3454

Applications are incomplete unless accompanied by copies of all plans specifications and drawings required. Details required for specific equipment are available on request. This application must be signed by a responsible member of the organization that is to operate the equipment for which application is made.

INCOMPLETE APPLICATIONS ARE NOT ACCEPTABLE.

1. Permit to be issued to (business license name of organization that is to operate the equipment):

Name Jeannie S. Mine Company

☒ Corporation ☐ Partnership ☐ Individual ☐ Government

Address P. O. Box 1190

Norristown, Pennsylvania Zip Code 19401

2. Address at which equipment is to be located: South of Boulder, Montana

3. General Nature of Business: Placer mining (see attachment)

4. General Equipment Description: Standard dryland placer washing plant, scrapers, bulldozers, loaders and rear dump trucks (see attachment)

5. Estimated Cost of Equipment of Alterations:

Basic Equipment $ _____ Air Pollution Control Equipment $ _____

6. Present Status of Equipment: Check and Complete Applicable Items.

	Estimated Starting Date	Estimated Completion Date
☒ New Installation	March-April 1980	Oct-Nov. 1987
☐ Alteration to Existing Installation		
☐ Transfer of owner, operator or lessee		
☐ Transfer of location		

(continued)

7. If this equipment had a previous permit, give: NA

Name _____ Most Recent Permit Number _____

8. Name, title and signature of responsible member of firm:

Name (Print or Type) Arthur J. Seiler

Title General Manager

Phone Number (215) 277-7350

Signature [signature] Date 10/7/79.

Person to contact regarding this application:

Name Richard Karp Phone (406) 443-5277

Appendix B. Soils Mapping Unit Description and Topsoil Analysis.

Mapping Unit Descriptions

(1AB) Alluvial soils

These are sandy soils along intermittent drainageways that vary in width from about 40 to 400 feet. Most slopes are in the 2 to 5 percent range. The landform consists of an irregular surface caused by a complex of the main stem drainage flanked by a system of braided drainages. The surface soils are primarily of sandy loam texture overlying loamy sand which rests on granitic sand. Depths to the granitic sand throughout most of the area ranges from 10 to 40 inches.

Topsoiling suitability: These soils are suitable for topsoil salvage down to the granitic sand. It is recommended that topsoiling material from these soils be taken in two lifts. The first lift to about 6 inches and the second lift to granitic sand. It is further recommended that both lifts be stockpiled in a mix of the first and second lifts of the soils from 38B, 38C and 138DE to offset the droughtiness of their sandy property.

(38B) OF, 2 to 5 percent slopes

These soils are on long gently sloping fan terraces. It has the profile described as typical for this soil. Land form is quite smooth so stripping operations can be accomplished without difficulty. Included in mapping are small areas of a strongly developed soil that has saline and sodic properties, comprising less than 15 percent of the unit. When these soils are mixed with the OF soils during stripping operations their undesirable properties will be diluted and will cause no problem in re-vegetation.

Topsoiling suitability: These soils are good for topsoiling material to about 40 inches being only fair below due to the sandy properties. The first lift will include both the A and B horizons. The Cca and subsequent horizons will be taken with the second lift.

(38C) OF, 5 to 9 percent slopes

The soils of this unit are similar to unit 38B except they are on steeper slopes.

Topsoiling suitability: The same as unit 38B.

(138DE) OFC, 9 to 35 percent slopes

This unit is a complex of OF soils on about 65 percent and C soils on about 35 percent of the unit. They are on steep side slopes of fan-terraces. The C soil occurs mostly near the top of the slope and on narrow ridges sloping toward the drainageways. The OF soil is generally on the smoother part of the land form between the lAB unit and the C soil areas. The OF soils have profiles similar to the one described as typical except that it has a thinner solum and is gravelly and cobbly on some areas. A typical profile of the C soil located at 875' west, 400' north of the SE corner of Section 5, T5N, R4W on about 20 percent slopes.

A_1 0-4 inches, grayish brown (10YR 5/2) when dry, cobbly loam; dark grayish brown (10YR 4/3) when moist; weak thin platy structure; slightly hard when dry, very friable when moist, slightly sticky and plastic when wet; weakly effervescent; clear smooth boundary.

C_1Ca 4-20 inches, pale brown (10YR 6/3) when dry, gravelly loam, brown (10YR 5/3) when moist, massive structure, slightly hard, very friable, slightly sticky and plastic; violently effervescence; clear wavy boundary.

C_2Ca 20-40 inches, pale brown (10YR 6/3) when dry, gravelly and very gravelly sandy loam; brown (10YR 5/3) when moist; massive structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet, violently calcareous; diffuse wavy boundary.

C_3 40 inches plue, light yellowish brown (10YR 6/4) when moist; coarse grained granitic sand, yellowish brown (10YR 5/4) when moist; single grain structure; loose consistence both dry and moist, non sticky when wet; weak effervescence.

Topsoiling suitability: These soils are only fair to poor for a source of topsoiling material due to steep slopes, areas of cobbly and very cobbly surface layers and thin solums. The smoother and less sloping areas of the OF soil offers the best source of material however, the stripping operator must use personal judgement to avoid very cobbly areas and sand substrata. Two lifts are possible in part of this unit whereas, other areas are unsuitable for topsoiling material.

(MW) Mine Waste

This map symbol is used to identify the spoil area left from placer mining and other mine spoils.

EERC ENERGY & ENVIRONMENTAL RESOURCE CONSULTANTS, INC.

Phone (406) 252-6325 ▪ 13 North 32nd Street
P.O. Box 593 ▪ Billings, Montana 59103

LABORATORY REPORT

Lab. No. 15645

To Systems Technology, Inc. Date 11-27-79

Address 616 Helena Ave. Helena, Montana 59601

TOPSOIL ANALYSIS

MINE JEANNIE S. MINE

(Analysis by procedures recommended by State Guidelines.)

SAMPLE NO.	1	2	3	4	5		6	7	8	9
HOLE NO.	Oro F (#1)						Oro F (#2)			
DEPTH, IN.	0-6	6-13	13-28	28-45	45-84		A 0-4	B 4-10	C Ca1 10-23	C Ca2 23-38
pH(1)	7.3	7.5	7.5	7.6	8.0		5.8	6.6	7.6	7.7
COND., mmhos(2)	1.02	1.01	5.35	4.78	0.88		0.35	0.56	4.79	3.09
SATURATION, %(1)	29.0	29.1	31.6	23.8	22.0		26.0	33.8	31.2	20.9
PARTICLE SIZE										
% SAND	62	62	64	74	84		70	48	49	68
% SILT	31	18	16	12	7		22	30	31	18
% CLAY	7	20	20	14	9		8	22	20	14
% VFS(3)										
CALCIUM, meq/l(4)	10.5	9.15	51.0	44.6	4.03		2.45	3.95	28.8	11.7
MAGNESIUM, meq/l(4)	0.87	1.33	40.9	39.9	3.81		0.53	0.88	24.6	11.1
SODIUM, meq/l(4)	0.29	1.19	11.4	8.24	1.21		0.20	0.82	22.3	16.4
SAR(5)	0.12	0.52	1.68	1.24	0.61		0.16	0.53	4.32	4.86
LIME, % as $CaCO_3$										
SELENIUM, ppm(6)										
BORON, ppm(6)	0.2	-0.1	-0.1	-0.1	0.1		-0.1	-0.1	3.3	0.6
NITRATE-N, ppm(7)										
MOLYBDENUM, ppm(8)										
TEXTURE(9)	SdyLm	SdyCly Lm	SdyCly Lm	SdyLm	LmySnd		SdyLm	Lm	Lm	SdyLm
ORGANIC MATTER, %										

NOTES: (1) MEASURED ON SATURATED PASTE. (2) CONDUCTIVITY @ 25° C, MEASURED ON SATURATED EXTRACT. (3) VERY FINE SAND. (4) MEASURED ON SATURATED EXTRACT. (5) SODIUM ABSORPTION RATIO. (6) WATER SOLUBLE. (7) NITRATE-NITROGEN, $CaSO_4$ EXTRACTABLE. (8) MEASURED AFTER HF DIGESTION. (9) USDA TEXTURAL CLASS. KEY: Cly = CLAY; Lm = LOAM; Lmy = LOAMY; Sdy = SANDY; Slt = SILT; Snd = SAND; Sty = SILTY.
(<or- indicates less than)

COMPANY Systems Technology, Inc. DATE 11-27-79 PAGE NO. 2

MINE LAB NO. 15645

SAMPLE NO.	10		11	12						
HOLE NO.	Oro F#2		Soil (#3)		SOIL #4					
DEPTH, in.	C3		A1	C						
pH(1)	No Depth		0-6	6-36	0-3	3-16	16-20			
COND., mmhos(2)	7.7		5.8	6.1	6.5	7.1	7.5			
SATURATION, %(1)	6.10		0.44	0.21	0.25	0.58	0.22			
	19.5		42.2	24.3	34.9	28.0	28.2			
PARTICLE SIZE										
% SAND	80		70	74	86.7	71.3	69.1			
% SILT	12		24	23	7.1	24.2	26.2			
% CLAY	8		6	3	6.2	4.5	4.7			
% VFS(3)										
CALCIUM, meq/l(4)	12.2		3.67	1.24	1.35	4.38	0.62			
MAGNESIUM, meq/l(4)	22.6		0.54	0.22	0.58	1.43	0.31			
SODIUM, meq/l(4)	53.5		0.31	0.20	1.22	0.51	0.92			
SAR(5)	12.8		0.21	0.23	1.24	0.30	1.35			
LIME, % as $CaCO_3$										
SELENIUM, ppm(6)										
BORON, ppm(6)	0.2		0.3	-0.1						
NITRATE–N, ppm(7)										
MOLYBDENUM, ppm(8)										
TEXTURE(9)	LmySnd		SdyLm	LmySnd	LmySnd	SdyLm	SdyLm			
ORGANIC MATTER, %										

SAMPLE NO.										
HOLE NO.										
DEPTH, in.										
pH(1)										
COND., mmhos(2)										
SATURATION, %(1)										
PARTICLE SIZE										
% SAND										
% SILT										
% CLAY										
% VFS(3)										
CALCIUM, meq/l(4)										
MAGNESIUM, meq/l(4)										
SODIUM, meq/l(4)										
SAR(5)										
LIME, % as $CaCO_3$										
SELENIUM, ppm(6)										
BORON, ppm(6)										
NITRATE–N, ppm(7)										
MOLYBDENUM, ppm(8)										
TEXTURE(9)										
ORGANIC MATTER, %										

(See Notes page 1)

Appendix C. Water Quality Information and Sample Analysis

Office Memorandum •

STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TO : Ralph Driear
Department of State Lands

DATE: January 14, 1980

FROM : Gary Ingman
Water Quality Bureau

SUBJECT : Water Quality of the Little Boulder River (Jefferson County)

Water quality data on the Little Boulder River is limited to results of analyses performed on samples collected in 1973 and 1975. All of these samples were collected at points near the stream's mouth on the Boulder River. Just upstream of this area, the Little Boulder River receives a discharge of both flow-through hot-spring pool water and treated domestic sewage from the Boulder Hot Springs Resort. Sewage treatment facilities consist of a two-cell lagoon and discharges to the river average an estimated 100 gallons per minute (MPDES permit number MT-0023639). The effluent quality is generally good. It is expected that water quality in the Little Boulder River upstream of this discharge may contain lower concentrations of nutrients, and fecal coliform bacteria than levels measured near the stream's mouth. Other parameters should not be appreciably affected due to a relatively high dilution factor.

Based on the available data, the Little Boulder River appears to be a primarily calcium-bicarbonate type of water which is typical of many western Montana streams. Dissolved chemical constituents (or total dissolved solids-TDS) calculated from specific conductance, averaged 102 mg/l, a content which is very low and would classify the water as excellent from the standpoint of drinking, based on this parameter alone. Little Boulder River water is moderately hard, and as such, some degree of buffering capacity would be provided against heavy metal pollution. Alkalinity, on the other hand, is relatively low and this factor would offer little natural buffering capacity against acid mine drainage. Turbidity data suggests a "clear" stream, with the common exception of during spring runoff. pH's are neutral. Nutrient data is limited to two analyses performed on samples collected in January and June of 1973. Nitrates, which may be contributed by domestic sewage or agricultural runoff, were very low on both occasions. Phosphate concentrations, however, were unusually high. The source, most likely, is the Boulder Hot Springs discharge, originating in either the sewage or from natural concentrations in the hot spring water, or a combination of both. It is presumed that levels in the river upstream of the discharge would be substantially less. These phosphate levels, together with an adequate supply of other nutrients (nitrogen and micronutrients) could be responsible for nuisance algae blooms in the lower river at certain times of the year and an enrichening effect in the Boulder River. Heavy metal analysis indicated relatively high levels of iron and marginally high levels of zinc and copper. It is doubtful that the metals originate in the resort discharge. Under the given hardness conditions, a factor which influences heavy metal toxicity, zinc and iron fall well below levels capable of detrimentally affecting freshwater aquatic organisms. Copper, on the other hand, has at least occasionally occurred in concentrations capable of inhibiting some species of freshwater invertebrates. The source of this contaminant remains unknown. A review of past or present hardrock mining in the drainage may provide a clue.

We have no flow data on the stream but apparently the U. S. Forest Service had a gaging station near the mouth for some period of time. I do not know if it is still active. They can probably provide you with discharge data if it would be of use. Additionally, I believe the Department of Fish, Wildlife and Parks may have done some work on the Little Boulder in the recent past including fisheries inventory work and a possible assessment of mining impacts. You may wish to contact them. Let us know if we can be of further assistance.

cc: Loren Bahls

Office Memorandum •

STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TO : Ralph Driear, DSL **DATE:** January 30, 1980

FROM : Gary Ingman, WQB

SUBJECT : Water Quality Impacts of Proposed Placer Operation in the Little Boulder River Drainage, Jefferson County

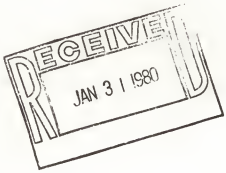
As you have described the proposed placer operation, the Water Quality Bureau foresees no significant impacts to ground or surface water quality, provided that the storage/settling pond facility can be maintained as a closed system. Degradation of the washwater within the system will be a result of increases in total suspended solids (TSS) and total dissolved solids (TDS). The silt would pose no threat to groundwater due to rapid settling and filtration. Percolation of the washwater with its increased dissolved solids load to groundwater reservoirs should be of little consequence. We have no reservations on this aspect of the project.

If the developers, however, find it necessary to pump the existing ponds dry and discharge this water to the river during construction of the new settling ponds and storage reservoir, there are some problems. Initially, they would be required to apply for a discharge permit through our office. Permit processing, as you may know, can be very time consuming. Secondly, the discharge water would have to meet the conditions of the nondegradation clause of existing water quality regulations. In summary, this clause states that new discharges must be equal to or better than the quality of the receiving stream. Although your enclosed chemical data shows the ponds to contain basically good quality water which would cause no major problems to the river for the short time it was being discharged, it nonetheless is of a lesser quality than that found in the river. This creates an obvious problem - the applicant's permit application might not receive approval.

We therefore would strongly recommend that the miners seek alternate methods of draining the ponds during the construction activity. One possibility might be to discharge the pond water to an adjacent coulee which had been previously diked off to contain the runoff until it could percolate into the ground. Most any method by which the party could temporarily drain the ponds without allowing the discharge to reach surface waters would save them a great deal of time and effort.

GI/jlt

cc: Loren Bahls



STATE: Montana

COUNTY: Jefferson

LATITUDE-LONGITUDE:

LOCATION: 5N 4W 9BCC

SAMPLE TYPE:

LAB NO.: 34988

DRAINAGE BASIN: 41E

DATE ANALYZED:

DATE SAMPLED: 10 - 26 - 79

TIME SAMPLED:

WATER FLOW RATE:

FLOW MEAS METHOD:

PROJECT: Chinese Diggings Station #1

REMARKS: Analized by Northern Testing - Billings

PARAMETERS REPORTED IN MILLIGRAMS PER LITER EXCEPT AS INDICATED

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)	53	2.66	BICARBONATE(HCO3)	329	5.39
MAGNESIUM (MG)	6	0.48	CARBONATE (CO3)	0	0.00
SODIUM (NA)	64	2.79	HYDROXIDE (OH)		
POTASSIUM (K)	4	0.10	CHLORIDE (CL)	12	0.34
TOT. IRON (FE)			SULFATE (SO_4)	21	0.44
MANGANESE (MN)			NITRATE (NO3)	0.03	-0.01
ALUMINUM (AL)			FLUORIDE (F)		
SILICA (SIO2)			PHOSPHATE (PO_4)		
TOTAL CATIONS		6.03	TOTAL ANIONS		6.17

LABORATORY PH	7.7
FIELD TEMPERATURE	
TOTAL DISSOLVED SOLIDS	
SPECIFIC CONDUCTANCE IN MICROMHOS/CM @25° C	600
SODIUM ADSORPTION RATIO	
OIL AND GREASE	
PHENOLS	
TOTAL COLIFORMS	
FECAL COLIFORMS	
FECAL STREP	
BOD_5	
D.O.	
COD	
Acidity	0

CARBONATE HARDNESS AS CACO3	
NON-CARB. HARDNESS AS CACO3	
TOTAL HARDNESS AS CACO3	157
TOTAL ALKALINITY AS CACO3	270
LANGLIER SATURATION INDEX	
RYSNAR STABILITY INDEX	
TECH. CORROSION INDEX	
T.R. LEAD (PB)	
T.R. ZINC (ZN)	-0.01
T.R. MERCURY (H_g)	-0.001
T.R. CADMIUM (CD)	
T.R. COPPER (CU)	-0.01
T.R. CHROMIUM-6 (CR)	
TOTAL SUSPENDED SOLIDS	4
Turbidity (NTU)	1.4
Arsenic	-0.005
Iron	0.05

" - " Means Less Than

STATE: Montana

COUNTY: Jefferson

LATITUDE-LONGITUDE:

LOCATION: 5N 4W 8ADA

SAMPLE TYPE:

LAB NO.: 34989

DRAINAGE BASIN: 41E

DATE ANALYZED:

DATE SAMPLED: 10-26-79

TIME SAMPLED:

WATER FLOW RATE:

FLOW MEAS METHOD:

PROJECT: Chinese Diggings Station #2

REMARKS: Analized by Northern Testing - Billings

PARAMETERS REPORTED IN MILLIGRAMS PER LITER EXCEPT AS INDICATED

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)	18	0.91	BICARBONATE(HCO3)	290	4.76
MAGNESIUM (MG)	34	2.80	CARBONATE (CO3)	0	0.00
SODIUM (NA)	45	1.95	HYDROXIDE (OH)		
POTASSIUM (K)	5	0.12	CHLORIDE (CL)	10	0.28
TOT. IRON (FE)			SULFATE (SO_4)	18	0.38
MANGANESE (MN)			NITRATE (NO_3)	0.03	-0.01
ALUMINUM (AL)			FLUORIDE (F)		
SILICA (SIO_2)			PHOSPHATE (PO_4)		
		5.78			5.42
	TOTAL CATIONS			TOTAL ANIONS	

LABORATORY PH	7.7
FIELD TEMPERATURE	
TOTAL DISSOLVED SOLIDS	
SPECIFIC CONDUCTANCE IN MICROMHOS/CM @25° C	510
SODIUM ADSORPTION RATIO	
OIL AND GREASE	
PHENOLS	
TOTAL COLIFORMS	
FECAL COLIFORMS	
FECAL STREP	
BOD_5	
D.O.	
COD	
Acidity	0

CARBONATE HARDNESS AS CACO3	
NON-CARB. HARDNESS AS CACO3	
TOTAL HARDNESS AS CACO3	185
TOTAL ALKALINITY AS CACO3	238
LANGLIER SATURATION INDEX	
RYSNAR STABILITY INDEX	
TECH. CORROSION INDEX	
T.R. LEAD (PB)	
T.R. ZINC (ZN)	0.01
T.R. MERCURY (H_8)	-0.001
T.R. CADMIUM (CD)	
T.R. COPPER (CU)	-0.01
T.R. CHROMIUM-6 (CR)	
TOTAL SUSPENDED SOLIDS	22
Turbidity (NTU)	6.4
T.R. Arsenic	-0.005
T.R. Iron	0.38

"-" Means less than

STATE: Montana

COUNTY: Jefferson

LATITUDE-LONGITUDE:

LOCATION: 5N 4W 8ADD

SAMPLE TYPE:

LAB NO.: 34990

DRAINAGE BASIN: 41E

DATE ANALYZED:

DATE SAMPLED: 10-26-79

TIME SAMPLED:

WATER FLOW RATE:

FLOW MEAS METHOD:

PROJECT: Little Boulder River Station #3

REMARKS: Analized by Nortern Testing - Billings

PARAMETERS REPORTED IN MILLIGRAMS PER LITER EXCEPT AS INDICATED

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)	15	0.75	BICARBONATE(HCO3)	56	0.92
MAGNESIUM (MG)	3	0.28	CARBONATE (CO3)	0	0.00
SODIUM (NA)	5	0.23	HYDROXIDE (OH)		
POTASSIUM (K)	1	0.04	CHLORIDE (CL)	-1	0.02
TOT. IRON (FE)			SULFATE (SO_4)	20	0.41
MANGANESE (MN)			NITRATE (NO_3)	0.03	-0.01
ALUMINUM (AL)			FLUORIDE (F)		
SILICA (SiO_2)			PHOSPHATE (PO_4)		
		1.30			1.35
		TOTAL CATIONS			TOTAL ANIONS

LABORATORY PH 7.1

FIELD TEMPERATURE

TOTAL DISSOLVED SOLIDS

SPECIFIC CONDUCTANCE IN MICROMHOS/CM @25° C 120

SODIUM ADSORPTION RATIO

OIL AND GREASE

PHENOLS

TOTAL COLIFORMS

FECAL COLIFORMS

FECAL STREP

BOD_5

D.O.

COD

Acidity 0

CARBONATE HARDNESS AS CACO3

NON-CARB. HARDNESS AS CACO3

TOTAL HARDNESS AS CACO3 51

TOTAL ALKALINITY AS CACO3 46

LANGLIER SATURATION INDEX

RYSNAR STABILITY INDEX

TECH. CORROSION INDEX

T.R. LEAD (PB)

T.R. ZINC (ZN) -0.01

T.R. MERCURY (H_g) -0.001

T.R. CADMIUM (CD)

T.R. COPPER (CU) -0.01

T.R. CHROMIUM-6 (CR)

TOTAL SUSPENDED SOLIDS 4

Turbidity (NTU) 2.2

T.R. Arsenic -0.005

T.R. Iron 0.57

"-" Means less than

STATE: Montana

COUNTY: Jefferson

LATITUDE-LONGITUDE:

LOCATION: 5N 4W 8ADD

SAMPLE TYPE:

LAB NO.: 34991

DRAINAGE BASIN: 41E

DATE ANALYZED:

DATE SAMPLED: 10-26-79

TIME SAMPLED:

WATER FLOW RATE:

FLOW MEAS METHOD:

PROJECT: Pete's Well - Alluvial Station #4

REMARKS: Analized by Northern Testing - Billings

PARAMETERS REPORTED IN MILLIGRAMS PER LITER EXCEPT AS INDICATED

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)	28	1.41	BICARBONATE(HCO3)	174	2.85
MAGNESIUM (MG)	15	1.23	CARBONATE (CO3)	0	0.00
SODIUM (NA)	19	0.81	HYDROXIDE (OH)		
POTASSIUM (K)	3	0.08	CHLORIDE (CL)	7	0.19
TOT. IRON (FE)			SULFATE (SO_4)	21	0.43
MANGANESE (MN)			NITRATE (NO3)	0.27	0.02
ALUMINUM (AL)			FLUORIDE (F)		
SILICA (SIO2)			PHOSPHATE (PO_4)		
TOTAL CATIONS		3.53	TOTAL ANIONS		3.49

LABORATORY PH 7.2

FIELD TEMPERATURE

TOTAL DISSOLVED SOLIDS

SPECIFIC CONDUCTANCE IN MICROMHOS/CM @25° C 340

SODIUM ADSORPTION RATIO

OIL AND GREASE

PHENOLS

TOTAL COLIFORMS

FECAL COLIFORMS

FECAL STREP

BOD_5

D.O.

Acidity 0

CARBONATE HARDNESS AS CACO3

NON-CARB. HARDNESS AS CACO3

TOTAL HARDNESS AS CACO3 132

TOTAL ALKALINITY AS CACO3 142

LANGLIER SATURATION INDEX

RYSNAR STABILITY INDEX

TECH. CORROSION INDEX

T.R. LEAD (PB)

T.R. ZINC (ZN) -0.01

T.R. MERCURY (H_g) -0.001

T.R. CADMIUM (CD)

T.R. COPPER (CU) -0.01

T.R. CHROMIUM-6 (CR)

TOTAL SUSPENDED SOLIDS 2

Turbidity 0.6 (NTU)

T.R. Arsenic -0.005

T.R. Iron -0.05

"-" Means less than

STATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	JEFFERSON
LAT.-LONG.	461330N 1115923W	SAMPLE LOCATION	6N 4W 33C
STATION CODE	0000159	ANALYSIS NUMBER	78W1445
DATE SAMPLED	07-25-78	DRAINAGE BASIN	041E -BOULDER R.
TIME SAMPLED	1500	WATER FLOW RATE	
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
SAMPLE SOURCE	WELL	ALTITUDE OF LAND SURFACE	
WATER USE	PUBLIC SPLY	TOTAL WELL DEPTH BELOW LS	70 FT
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	KGBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: BOULDER RIVER SCHOOL WELL NO 1

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)	13.7	0.684	BICARBONATE(HCO3)	36.6	0.600
MAGNESIUM (MG)	2.9	0.235	CARBONATE (CO3)	0.0	0.0
SODIUM (NA)	5.7	0.248	CHLORIDE (CL)	2.4	0.068
POTASSIUM (K)	1.3	0.033	SULFATE (SO4)	28.4	0.591
			FLUORIDE (F)	0.21	0.011
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)	0.03	0.002
SUM CATIONS	23.6	1.200	SUM ANIONS	67.6	1.272

LABORATORY PH	7.34	TOT HARDNESS(MG/L-CACO3)	46
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	30
SUM-DISS. IONS MEAS.(MG/L)	91.2	LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHOS-25C	133.3	SODIUM ADSORPTION RATIO	0.4

ADDITIONAL PARAMETERS

ARSENIC,TR (MG/L AS AS)	< .001	CADMIUM, TR (MG/L AS CD)	< .001
LEAD,TR (MG/L AS PB)	< .005	MERCURY, TR (MG/L AS HG)	< .0002
SELENIUM,TR (MG/L AS SE)	<.005	CHROMIUM,TR (MG/L AS CR)	< .005
SILVER, TR (MG/L AS AG)	<.005	IRON,TR (MG/L AS FE)	.30
MANGANESE,TR(MG/L AS MN)	.005	BARIUM, TR (MG/L AS BA)	< 0.1

REMARKS: DRINKING WATER ED TASTE PROBLEMS-IRON BACTERIA SUSPECT

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITLENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO SAMPLER OLF HANDLING 3200 ANALYST JAH LAB KGBH
COMPLETED 12-12-78 COMPUTER RUN 12/19/78 DATA C975/PROG 0876 FUND 6254

NO DEV. ION BALANCE	0.66	CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
SEGMENT NPUES		57.0	19.6	20.7	2.6	5.4	47.0	47.7	0.0	0.0
CALC. MEQ/L=	1.112 TO	1.229								

78W1445

Appendix D. Existing Vegetation Species List

Vegetation Species List

Trees

Aspen (Populus Tremuloides)
Willow (Salix spp.)
Douglas fir (Pseudotsuga mezesii)
Cottonwood (Populus deltoides)
Lodgepole pine (Pinus contorta)
Rocky Mountain juniper (Juniperus scopulorum)

Shrubs

Big sagebrush (Artemisia tridentata)
Broom snakeweed (Xanthophyllum sarothrae)
Gooseberry (Ribes spp.)
Wild rosebush (Rosa spp.)
Rubber rabbitbush (Chrysothanus nauseosus)
Sagewort (Artemisia spp.)

Grasses and Grasslike Plants

Blue gramma (Bouteloua gracilis)
Needle and thread (Stipa comata)
Prairie junegrass (Koeleria cristata)
Bluebunch wheatgrass (Agropyron spricatum)
Western wheatgrass (Agropyron smithii)
Cheatgrass (Bromus tectorum)
Kentucky bluegrass (Poa secunda)
Sedges (Carex spp.)
Slender wheatgrass (Agropyron trachycaulum)
Basin wild rye (Elymus cinerius)
Columbia needlegrass (Stipa)
Sandberg bluegrass (Poa)
Foxtail barley (Hordium jubatum)

Forbs

Dalmation toadflax (Linaria dalmatica)
Fringe sagewort (Artemisia frigida)
Scarlet globemallow (Sphaeralcea coccinea)
Aster species (Aster)
Whitepoint loco (Oxytropis sericea)
Salsify (Tragopogon dubius)
Yellow sweetclover (Melilotus officinalis)
Vetch species (Vivia / Astragalus)
Curlycup gumweed (Grindelia squarrosa)
Wooly plantain (Plantago purshii)
Spotted knapweed (Centaura maculosa)
Leafy spurge (Euphorbia esula)

Forbs (continued)

Lupine (lupinus spp.)
Dandelion (Taraxacum officinale)
Mustards (Brassicaceae)
Western yarrow (Archillea millifoluim)
Pigweed (Armranthacaceae)
Thistle species (Circium, Cardus)
Sunflower (Helianthun spp.)

Miscellaneous

Club moss (Selaginella densa)
Cactus (Opuntia)
Lichens
Mushrooms

Appendix E. Department of Fish, Wildlife, and Parks Letter

STATE OF MONTANA

DEPARTMENT OF

FISH AND GAME

Helena, MT 59601
August 17, 1979

Mr. Ambrey Gartner
Systems Technology, Inc.
616 Helena Avenue
Helena, MT 59601

Dear Mr. Gartner:

As requested, we have looked into the mining property in Jefferson County outlined on the map you transmitted to me on July 17. Examination of our records shows that we have made no specific fish and wildlife inventory of this site in the past, and so we have no existing data on file to offer you.

We did inspect the site on August 16 and from our observations on that day offer the following information:

The site outlined on your map in Section 5, T5N, R4W reveals considerable use by mule deer that apparently occurs over several seasons of the year. The precise time and nature of this use can only be ascertained from detailed observations of the animals while using the site. Most of the evidence of deer use, and possibly some occasional use by elk, was observed west of the Little Boulder Creek road.

East of the road the properties apparently lap into the old Chinese diggings that have been undergoing a gradual process of natural reclamation since these diggings were abandoned.

While the property west of the road is dominated by a sagebrush-grassland type, a rather diverse vegetative community is being established in the old diggings. We suspect that that diversity now accommodates some use by a variety of wildlife species such as small birds and possibly small mammals.

We sincerely hope that some type of inventory data can be collected on that site and made a part of any application for a mining permit.

We did not observe any evidence, nor do we have any reason to believe, that any rare or endangered species utilize the site identified.

Sincerely,

James A. Posewitz, Administrator
Ecological Services Division

JAP/sd
cc: LeRoy Ellig
Don Childress

60 copies of this publication were produced at a unit cost of $2.90 per copy, for a total cost of $174 which includes $134.40 for printing and $39.60 for distribution.

These printing and distribution costs were paid by Dept. of State Lands pursuant to Title 75, Chapter 1, Part 2, MCA

DEPARTMENT OF STATE LANDS

THOMAS L. JUDGE, GOVERNOR

CAPITOL STATION

STATE OF MONTANA

(406) 449-2074

LEO BERRY, COMMISSIONER

1625 ELEVENTH AVENUE
HELENA, MONTANA 59601

APRIL 9, 1980

PLEASE RETURN

Office of the Governor
Capitol Station
Helena, Montana 59601

Environmental Quality Council
Capitol Station
Helena, Montana 59601

All other commenting or consulting parties

Attached are the comments received by the Department of State Lands on the Draft Environmental Impact Statement for the proposed Jeannie S. mine near Boulder, Montana. Also Attached are the comment responses prepared by the Department.

Subsequent to issuance of the Draft EIS for the proposed mine, the applicant has indicated that an accelerated rate of mining is now anticipated following the start of mining. The mining operation is now planned to be completed approximately 2 years following issuance of the mining permit. A review and consideration by the Department of the comments received and the new mining schedule since the issuance of the Draft EIS, however, has not altered significantly the results and conclusions reached regarding the significance and magnitude of the potential impacts identified in the Draft EIS. Because of this, the Department of State Lands has determined that it will not be necessary to compile a final environmental impact statement as provided for by the Department's MEPA rules adopted and effective January 18, 1980. Pursuant to these rules, the Department plans to make its decision on the application by the Jeannie S. Mining Company not less than fifteen (15) days after sending copies of this document to the Governor of Montana, the Montana Environmental Quality Council, the mining company, and all other commenting or consulting parties. To assure compliance with the requirements of the Metal Mine Reclamation Law, the operation, if approved, will be inspected by the Department at least four times annually. A $157,000 bond is being required by the Department to assure reclamation of the mine site.

Attachments

United States Department of Agriculture
Soil Conservation Service
P.O. Box 970
Bozeman, MT
59715

March 28, 1980

Ralph Driear
Environmental Administrator
Department of State Lands
Capitol Station
Helena, Montana 59601

Dear Mr. Driear:

We acknowledge receipt of the draft environmental statement for the prepared plans of mining and reclaimation for the Jennie S. Mine Company in Jefferson County, Montana.

We have reviewed the above draft environmental statement and have the following comments:

1) The mining operation is scheduled over a six to seven year life. This would not be compatable with the planned water storage project.
2) Overburden will be used to build the planned retention dam and to recontour the existing highwall areas. A large portion of the overburden is planned to be used in the core section of the proposed Little Boulder Creek dam.
3) Mining operations will mix the overburden. As a mixed soil, it may not be usable as impervious fill.
4) Without watering the stockpile area, wind and water erosion could be high in the silty soils.
5) We do not believe that saline or sodic salts will be a major problem as most of the soils are granitic in origin.
6) Runoff from the ten year 24-hour precipitation may be higher than projected if a sizeable portion of the mining area is stripped to bedrock and left bare for two years or more.
7) Water from the well at the Boulder River School (well number 1) has much greater recharge than groundwater that occurs in the proposed mining areas. This data should not be used, as water sources and quality could be expected to be different.
8) The mining area is close to new residential homes. Noise and increased traffic could affect these developments. Dust could also be a problem.
9) The biggest problem for the development of the Boulder River reservoir would be the length of time of the mining operation and the probable mixture of borrow materials. This could change the soil permeability and strength factors considerably and change embankment slopes enough to considerably increase the cost of the dam.

10) We also have a concern over the possible effects of settling basin for mining and imponded water covering them at a later time. What will this do to turbidity and possible heavy metals concentration? How will possible spills from settling pond be addressed?

11) Page 9, Item 2, Revegetation, Table 2. Proposed Seeding Mixture for Reclamation. Thick spike and Western wheatgrass are not well adapted for this site. Red clover is only adapted to the sub irrigated areas of this site. Pubescent wheatgrass is not well adapted to these low rainfall sites with granitic soil materials.

I would suggest the following mixture for revegetating these mine spoils:

	Seeding Rate	
	PLS lbs/ac	Seeds/sq.ft.
Slender wheatgrass	2	6
Bluebunch wheatgrass 1/	4	12
Basin wildryegrass	3	10
Siberian wheatgrass 2/	2	7
Ladak alfalfa	1	5
	12	40

Canada bluegrass could be broadcast on sites that are accumulating extra water.

1/ Beardless wheatgrass may be substituted for Bluebunch wheatgrass

2/ Nordan or Fairway crested wheatgrass may be substituted for Siberian

12) In reference to fertilizer application, page 11, first paragraph, it is suggested that the initial fertilizer application should be incorporated into the topsoil at least 4 inches deep. Incorporating the fertilizer will make the phosphate available for plant use and prevent some of the loss of nitrogen into the atmosphere.

In regard to establishing temporary cover on the stockpiled topsoil or other disturbed areas, you might wish to consider a less complex mixture. If the cover is only needed for a few months, a cereal grain could provide adequate cover. For longer stabilization, Canada wildrye or Crested wheatgrass could be planted.

13) In reference to replacing the topsoil; care should be taken to make sure that the surface horizon contains as high a percent as possible of the original topsoil to provide for organic material and good bacterial action in the soil. If sterile material must be used for topsoils, barnyard manure could be incorporated to provide the necessary organic material and to initiate bacterial action.
14) III Mitigating or Compensating Measures, 6. Flora, page 36. It is suggested that the seeding mixture presented on page 36 is not very appropriate for the site as described in this document. Canada bluegrass is only adapted on sites that accumulate extra water in this rainfall zone. Thick spike and Western wheatgrass are not well adapted to these soils. Cicer milkvetch is not well adapted to these drouth soils or to the cold wet subirrigated soils in this region. Red clover will only grow on the subirrigated areas of this site. Green needlegrass is not well adapted to these areas with granitic soils and 10-12 inches precipitation. It is suggested the same mixture as described under Item B be used.
15) Other suggested changes are on page 9, Table 2, a) Changing the title to read Proposed Seeding Mixture for Reclamation, and b) Appendix D, suggested changes in scientific names.

In the development of the watershed work plan, it was projected that borrow material for the watershed dam could come from the area where mining is now planned. If this could be done in proper sequence, it would be possible to benefit both projects. Mining operations that would displace surface materials or mix them with other materials could make them unsuitable for use in the watershed dam.

16) It is recommended that the mining company coordinate their plans with the sponsors of the Boulder River Watershed to develop a more detailed plan for saving borrow material or having it removed in a timely manner for the watershed project to the extent that it is practical.
17) If chemicals are used in the mining operation, the residues could cause future pollution to the planned watershed reservoir. This could have serious effects on the future use of the reservoir for a fishery or recreation.

Attached is a copy of a map showing how the planned mining operation would impact on the planned watershed reservoir area.

Sincerely,

Van K Hadaflie
State Conservationist

Attachment

The rules and regulations adopted pursuant to the Metal Mine Reclamation Act provide that:

> Proper precautions must be taken to assure that exposed cuts, tailings, or spoil disposal areas will not be subject to wind erosion to the extent the air-borne detritus becomes a public nuisance to the flora and fauna of the area.

9) See response to comment 3.

10) If the proposed irrigation reservoir becomes a future reality and the settling pond at the mine site is inundated, the resulting turbidity is expected to be limited to the general area of the pond. The proposed pond site is isolated from the main body of the reservoir by a ridge of unmined ground and the proposed road relocation fill.

Accumulation of heavy metals in the settling pond is considered unlikely. If heavy metals were to accumulate they could be expected to be in an insoluable form. The granitic nature of the area soils and the lack of the use of chemicals in the gold seperation process would not be conducive to the formation of acidic conditions. Acidic conditions could cause any heavy metals present to become soluable and hence a possible hazard. To further reduce the threat of heavy metal contamination of the reservoir the Department could require the mining company to analyse the pond sediments prior to future inundation by the reservoir. If heavy metals were found in significant amounts corrective measures could be taken.

Any escape of surface water from the pond during an intense precipitation or runoff event is anticipated to be lost as subsurface seepage a short distance from the pond because of the very porous nature of the previously mined gravels in the area.

11) The Department has revised the seed mixture proposed for use in reclaiming the mine site as follows:

	PLS lbs/ac
needle and thread grass (deawned)	2
canada bluegrass	1
slender wheatgrass	2
bluebunch or beardless wheatgrass	4
basin wildrye (if available)	3
streambank wheatgrass	2
ladak alfalfa	1
	15 PLS

It is considered that the revised mixutre will increase the potential for successful reclamation, while still providing for the establishment of a diverse vegetation cover.

12) Agreed, however, caution should be taken not to incorporate the initial fertilizer any deeper than 4 inches or some of its benefits may be lost.

Temporary vegetation cover on stockpiles could be established using a cereal grain as suggested.

13) Agreed.

14) See response to comment 11.

15) Comment noted.

16) Agreed.

17) No chemicals are proposed to be used in the mining operation at this time.

STATE OF MONTANA

DEPARTMENT OF

FISH AND GAME

Helena, MT 59601
March 25, 1980

Mr. Ralph Driear
Environmental Coordinator
Department of State Lands
Helena, MT 59601

Dear Ralph:

We have reviewed the DEIS on the proposed plans of mining and reclamation for the Jeannie S. Mine Company's placer gold mine, Boulder, Montana and have the following observations and comments:

It appears that the overburden from the operation will not be replaced, but will be disposed of in one area that will end up with some rather steep slopes. This seems to be considerably different from what would be required of an operation that was strip mining for coal. I assume that this discrepancy is related to the fact that these activities are covered by different and distinct laws. The steep slopes of the overburden disposal site will make effective reclamation of these areas rather difficult.

Several other sections of the DEIS, especially the portion dealing with reclamation, give the general impression that the implementation of stipulations is more voluntary than mandatory. Hopefully, the mining company will conscientiously abide by your suggestions.

Thank you for the opportunity to review this document.

Sincerely,

Robert R. Martinka, Chief
Bureau of Baseline Studies

RRM/sd

Response to Dept. of Fish, Wildlife, and Parks letter

Overburden from the mining operation will be replaced in each successive mine cut similar to coal strip mining reclamation. The overburden from the first cut will be stockpiled for use in reclamation on the last cut. Because of swell factors, the entire amount of overburden removed from the cuts will not be able to be replaced in the cuts following completion of the mining operation. The amount of excess overburden material that may have to be permanently stockpiled, however, may be reduced substantially if the mining company and the sponsors of the proposed irrigation reservoir can reach an agreement on its use in the construction of the reservoir dam.

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

THOMAS L. JUDGE, GOVERNOR

32 SOUTH EWING

STATE OF MONTANA

(406) 449-3712

HELENA, MONTANA 59601

March 18, 1980

Mr. Ralph Driear
Environmental Administrator
Department of State Lands
Helena, MT 59601

Dear Ralph:

I have received only one comment regarding the draft environmental impact statement for the Jeannie S. Mine Company's gold placer mine near Boulder. The comment pertains to the reference to a large pile of overburden (45 feet high, 250 feet wide, 375 feet long) on page 15 of the DEIS. It is implied that this pile would be left as a permanent part of the topography after reclamation. The suggestion I received was that this material should be placed back into the mine area, contoured and then reclaimed by spreading previously segregated subsoil and topsoil on these materials. I trust you will address this in the final environmental statement.

Sincerely,

Wayne Wetzel

Wayne Wetzel
Special Staff

cc: Rich Moy
WW/bw

Response to Dept. of Natural Resources and Conservation letter

See response to Dept. of Fish, Wildlife, and Parks letter.

MONTANA HISTORICAL SOCIETY

HISTORIC PRESERVATION OFFICE

225 NORTH ROBERTS STREET • (406) 449-4584 • HELENA, MONTANA 59601

February 26, 1980

Mr. Ralph Driear
Environmental Administrator
Dept. of State Lands
Helena, MT 59601

RE: DEIS Jeannie S. Mine

Dear Mr. Driear:

Thank you for the opportunity to review this draft Environmental Impact Statement. I concur with your surveyors conclusion that no actual or potential Heritage properties were identified by the professional survey. Therefore this project is in compliance with the State Antiquities Act.

Sincerely,

Dr. Robert Archibald
Acting SHPO

RA/TF/prb